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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Sixty-three-Inch Lathe.

We give on this page an illustration of a lathe which is typical of a class of lathes of similar sizes built by Bement, Miles & Co., of Philadelphia, Pa.

The lathe swings 63″ over the shears, and 50″ over the carriage, and can, of course, be made with any length of bed desired, and with two carriages if wanted. The cone pulley is not on the main spindle of the lathe, but is in front of it, and drives the face-plate by means of a pinion which engages with an internal gear which is in the plate and near its outer edge. This pinion may be driven direct by the pulley or through the medium of the gearing seen in front, which is engaged and disengaged by sliding the shaft by means of the lever. The cone pulley is for a 5″ belt, the largest step being 30″ diameter, the smallest 11″. There are two speeds on the countershaft, which are so arranged that there are twenty different rates of speed for the spindle. The spindle is of cast-iron, running in cast-iron boxes, the main bearing being 10″ diameter, 12½″ long; and the rear bearing 7″x10¼″.

The lead screw is driven by gearing at the end of the head in the usual manner, but inside the head there are "cone gears" arranged on the stud, so that by sliding a key three different speeds are imparted to the screw with each arrangement of the change gears. The key is moved by means of the small hand wheel seen at the side of the gear-shifting lever, there being a pinion on the other end of the shaft, which engages with a cylindrical rack.

The screw is splined, and there are two bevel pinions upon it, which engage with a larger gear within the apron of the carriage, these pinions being shifted to reverse the feed motion.

Screws can be cut from 9 to the inch to 6″ pitch, and the feeds can be varied from $\frac{1}{12}$ inch to $\frac{1}{4}$ inch.

There is an automatic cross-feed, and at the side of the cross-feed screw there is a splined shaft, which, by means of bevel gears and an upright shaft connected with it, gives an automatic feed to the compound rest, which, of course, operates in any direction.

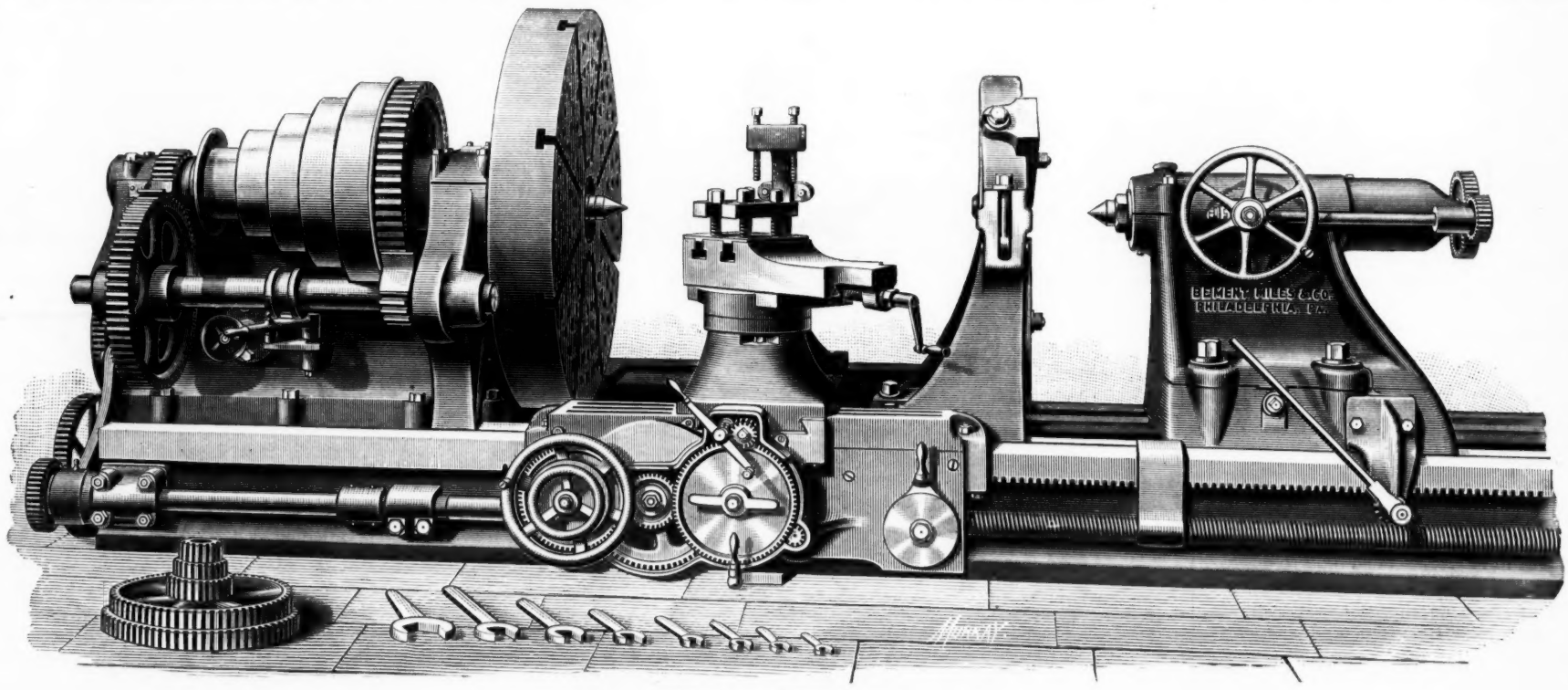
The foot-stock spindle is 7″ diameter, and is moved by a hand wheel which is brought forward into a convenient position. The foot-stock is moved upon the bed by means of the rack and pinion shown.

The centers of this lathe are not vertically over the center of the bed, but are carried back from the center 9″, the object of this being to get as good a support for the carriage as would be secured by a bed considerably wider if made in the ordinary way.

This arrangement, of course, brings the workman that much further from his work, but this is compensated for by reducing the width of the carriage at the right, which can readily be done, since there is no gearing there, and, in fact, nothing within the apron at that point except the nut for the lead screw, and the device for preventing its being thrown into engagement when the rack feed is in.

The bed is 49″ wide, and the carriage has a bearing upon it 64″ long. The feed rack is of steel, bolted to the bed.

The general proportions of the lathe are well shown by the engraving, and, as would be expected, the lathe has, in use, proven itself to be exceptionally well adapted to heavy work, and to the heavy duty now being demanded of machine tools.



SIXTY-THREE-INCH LATHE.

The Sixty-first meeting of the Institute of Mining Engineers will be held at Baltimore, Md., beginning on Tuesday evening, Feb. 16. J. W. Tyson, of Baltimore, chairman of the local committee, will give information as to local arrangements.

It is claimed that electric light is furnished in Philadelphia at a price that is quite as low as the price of gas.

The Hand Wheel Lunacy.

BY WILLIAM H. HARRISON.

This particular form of insanity seems to have taken such a hold upon the minds of all classes of engine and machine makers that I am moved to write a few words, hoping to lead to a cure.

During a late visit on board one of our new naval ships—and a very fine ship she is, though rather expensive to be used as a target for the other people to fire their stuff into—while they were preparing to get up steam I observed two men jammed pretty close together and prying with pinch bars down in a round hole in the floor. After much bad language which was evolved each time that the pinch bars slipped from their supports, the thing was started, and one man started for the tool room with the pinch bars, and the other kept on with the work, which was screwing open the injection valve of the main engine.

I noticed that this valve had the usual hand wheel, with a rim about 20″ diameter and a section of 1¼″ diameter, which rim would weigh about thirty-five pounds, and this in a ship where especial consideration had been devoted to lightness.

Everywhere that I went were these hand wheels, thousands of them, big and little, and on one of the boiler stop valves I observed two men, with monkey-wrenches this time gripped on the rim, heaving it open; for be it remembered that there is no large conical valve which will close tight when its spindle is horizontal, unless by accident; consequently there is much heaving and fussing when the valve is really required to perform the function for which it is carried in the ship. There is no more ineffective and clumsy way by which a man can waste his strength, and accomplish little, than in gripping the polished and oily surface of these wheel rims with his hands, particularly in a hot engine room; and yet a short time ago there was published a picture of an engine room in an ocean steamer, showing a hand wheel with smooth rim for moving the throttle, and the wheel was directly over the head of the engineer—a fine combination of inconveniences.

The remedy is to fit all large valves with a simple T-head, and small valves, globe valves and the like, with cranks; it only requires handling once to prove to any one the superiority. In the case of a valve moved by a single crank, an important gain in time is made, as a continuous rotary motion is kept up, using the powerful muscles of the arm, while in the hand wheel system only part of a turn can be made at a time, using the weak muscles of the wrist.

There follows also with the T-head system a reduction of weight and cost, and the stuffing box is always easily accessible for packing and tightening, which is not the condition where the work must be done by poking among the arms of a hand wheel, and the temperature of the iron is 300 or 400 degrees.

Coming now to machines, we look through the advertising pages of the AMERICAN MACHINIST, and here we find a curious diversity, not only between different makers, but between different parts of the same machine. First, is a lathe showing on its front five simple cranks, and two made by inserting handles in the rims of wheels.

No. 2 is an old-style lathe, all the handles of which are of the crank and ball pattern. The ball balances the crank, and the arm produces the least possible obstruction to cleaning the apron.

No. 3 is a neat-looking bolt cutter with two hand wheels, one for tightening the jaws on the bolt, the other for forcing the bolt into the dies; when the apprentice boy gets his monkey-wrench to work on these wheels he will make short work with their good appearance.

No. 4 is a pipe cutter, and nothing requires so tight a squeeze as a pipe; yet here

you may see a little hand wheel which will soon be masticated by the action of the wrench—a pipe wrench this time—and pipe wrenches have teeth.

No. 5 is another little bolt cutter; here the maker has evidently seen his own machine at work, and to save his monkey-wrenches has fitted a simple lever for forcing in the bolt and handles on the rim of his jaw wheel. If he proceeds still further in the way of development he will throw away his old hand wheel pattern and use a simple two-ended lever.

No. 6 is a brass fitter's lathe; here all the light strains above the bed are worked by simple levers, yet below the tightening of the slides is accomplished with more or less uncertainty by the ever-present hand wheels. The only good thing about them for this location is that they prevent a certain amount of oil and chips from falling on the floor—an advantage which is unnecessary where pans are used.

A young friend of mine, who is something of a draftsman, and accustomed to look at things from a drawing room rather than a shop point of view, inquires, "What are we to use, then?" My answer to that is to refer him to No. 7, which is a vise; and there is nothing better than a vise for holding things; its handle can always be shifted out of the way and used at either end.

How worthless a vise would be if it were ornamented with a hand wheel in front and required a monkey-wrench for tightening.

A New Independent Reversible Jaw Chuck.

We give herewith illustrations of a new line of lathe chucks which have recently been brought out by the Skinner Chuck Company, of New Britain, Conn.

The body of this chuck is made in a single piece, so designed as to make the chuck as light as possible for handling, and so that the lathe spindle is not unnecessarily loaded, while at the same time those parts of the body which take the thrust of the screws, and on which the jaws slide, are made extra heavy.

The bearings of the screws in the case are spherical, and when work is to be held on the outer faces of the jaws, the thrust of the screws is taken on a hardened steel collar, which screws into the central hole of the case. This collar is easily removed by a spanner which is furnished with the chuck, and is to be removed when the jaws are run off the screws to be reversed.

Fig. 1 shows the chuck as made in sizes from 6″ to 10″ inclusive; Fig. 2 from 12″ to 24″; Fig. 3 from 24″ to 42″; Fig. 4 a back view of the same; Fig. 5 a section showing the steel collar removed, and one of the jaws with its screw removed and reversed.

The 12″ and all chucks larger have the slots shown by which work can be held by bolts when desired.

It is announced that Prof. Rowland, of Johns Hopkins University, has succeeded in making a new screw for his dividing engine, which is more nearly perfect than any which has heretofore been produced.

It is made of Jessop's tool steel, annealed by the makers. It is 1¼″ diameter, 17″ long, and has 20 threads per inch. It was first cut in a lathe in the ordinary manner, and then ground by using a nut equal to it in length, which was placed on it with washed emery, and the screw revolved under a bath of water and oil maintained at a constant temperature. The grinding required about three weeks. It is to be used mainly in ruling gratings for spectroscopes, and it is thought will be capable of ruling a million lines to an inch. There are a thousand notches in the head attached to the screw, so that the movement of a notch advances the thread one twenty-thousandth of an inch.

The Illinois State Grange of Patrons of Industry has resolved against the granting of passes by railroads to public officials, and placed itself in favor of government control of railroads, telegraphs and telephones.

Railroad Progress in Japan.

In regard to the general condition of railroad construction in Japan, during the year ending March, 1890, *Industries*, of London, gives the following particulars:

The Tokaido Line.—At the end of March, 1889, only 47 miles were uncompleted. Most of the work on it was, however, already done, and the line was opened for traffic on the 16th of April, 1889.

The Yokosuka Line.—This line was completed and opened on June 10th, 1889.

The Biwa Lake Shore Line.—The only work to be done in the year under notice was the erection of some of the bridges, of a total length of 2,010 feet, and the arrangement of the stations and buildings. This was completed and the line opened for traffic on the 1st of July, 1889.

The Oyama and Numazu Line. — Owing to the numerous gradients, it was decided to double this line, and the necessary surveys were commenced in August, 1889. The new line will have a length of about 22 miles. There will be 18 bridges on the line, the most difficult work in connection with which will be with those over the Aizawa and Kise-gawa. The estimated cost of this line is £71,820, and some progress has already been made with its construction.

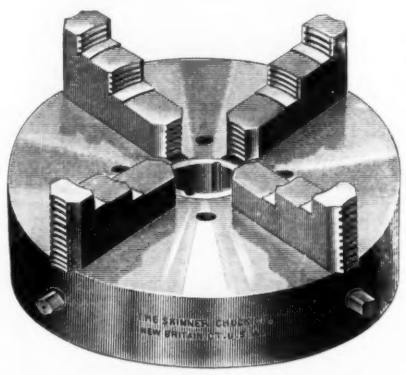


Fig. 1.

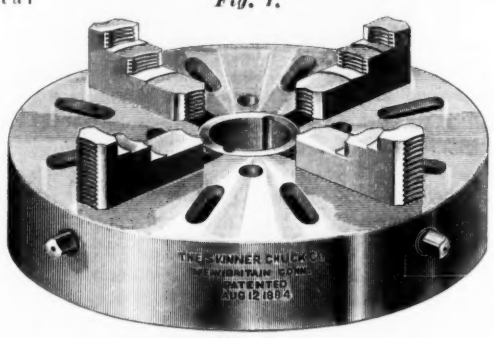


Fig. 2.

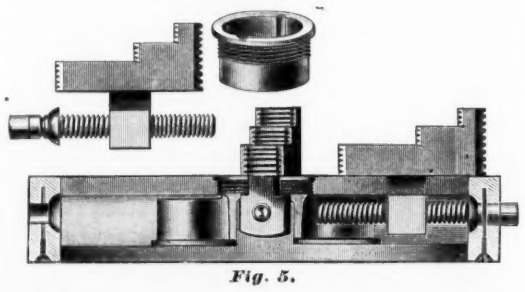


Fig. 5.

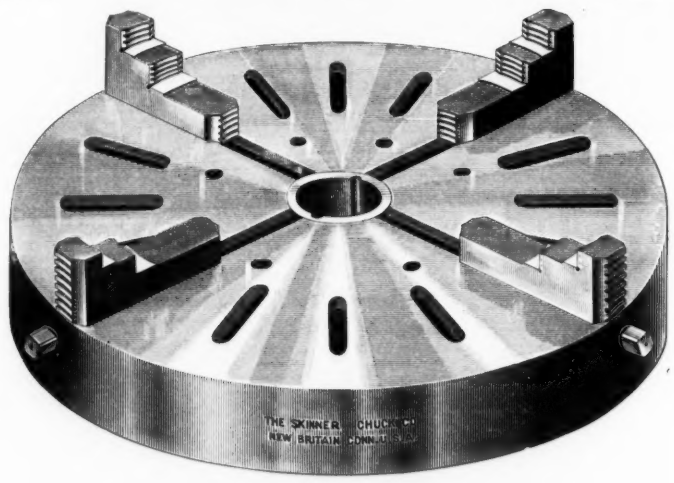


Fig. 3.

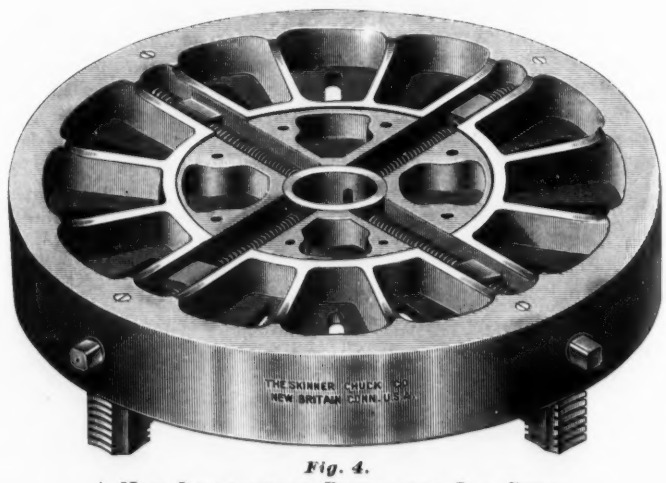


Fig. 4.

A NEW INDEPENDENT REVERSIBLE JAW CHUCK.

The Naoetsu Line.—Portions of this line were opened for traffic as they were completed, but the whole line between Naoetus and Karuizawa was not opened till the 1st of December, 1888. A large quantity of work, however, remained to be finished, which was completed during the year under notice. A large amount of additional work was also rendered necessary by floods.

Revenue.—At the end of March, 1890, there were 542 miles of government railways open for traffic, 103 of which had been opened during the preceding twelve months. The revenue, working expenses, and net profit made on these lines during that year are as follows, assuming 6 yen = £1:

Revenue....	£628,605
Working Expenses	£277,236
Net Profit....	£351,369

GENERAL CONDITION OF WORKS ON PRIVATE RAILWAYS CARRIED ON BY THE GOVERNMENT RAILWAY DEPARTMENT.

The Nippon, Ryomo, Mito, and Kobu Lines.—The Nippon Company's lines from Sendai to Morioka were nearly completed, the only uncompleted portion at the date of the report being the bridges and tunnels between Ichinoseki and Morioka. The same class of work was also in hand on the line between Morioka and Aomori. A branch line to Nikko, and a greater part of the line between Utsunomiya and Imaichi—a distance of about 20 miles—have been completed. On the Ryomo line, the section between Kiryu and Maebashi was completed and opened for traffic on the 20th of November, 1889. The whole of the line of the Kobu Railway was opened on the 11th of August, 1889, and a new station has since been erected at Hino.

The expenditure of the department on construction account of the Nippon, Ryomo, Mito, and Kobu Companies during the year under notice amounted to £575,584.

As regards new private railway lines, charters to construct lines were granted to the following companies: The Chikuho Kogyo Railway Company, for lines 29 miles in length, from Wakamatsu and Iizuka, and from Naokata to Kandamura; the Sanyo Railway Company, line 1 mile 43 chains, from Kobe to Hyogo; Koshin Railway Company, line 72 miles, from Kofu to Matsumoto; Nippon Railway Company, lines from Utsunomiya to Imaichi, 20 miles 60 chains, and Imaichi to Nikko, 4 miles 19 chains.

Hokkaido Tanko Railway Company, lines from Muroran to Sorachifuto, and branches to Sorachi and Yubari, 130 miles; Sobu Railway Company, line from Koiwa to Sakura, 25 miles 40 chains. Provisional charters were also granted to seven other companies, involving about 300 miles of new railway, while provisional charters to four other companies, representing about 90 miles, were under consideration.

The total number of new lines, including both the government lines and those belonging to private companies, opened in the year under notice, amounted to 222 miles.

There are still many parts of Japan requiring railways, and it is to be hoped that past experience will be taken as a guide for the future, and steady progress will be made in the extension of railways throughout the country.

A New Quick-firing Gun.

What is believed by French engineers to be the best quick-firing gun yet invented is that which is at the present moment being perfected by M. H. Schneider at his works at Creusot. How far this belief is justified will shortly be seen, for M. Schneider hopes to be able to test officially his new gun in three or four weeks' time. During the past two years M Schneider has been actively occupying himself with the question of providing a perfect quick-firing gun, and in June, 1889, he suggested to the Minister of Marine the necessity of undertaking the manufacture of guns of 12 cm. and 15 cm. upon the Armstrong system, for which he had been assured a concession. He was convinced that the system was not perfect, though it had been adopted by the English and Italian Navies. It was, however, at that time, the only big caliber gun that had withstood the necessary tests. Upon the proposition being rejected, M. Schneider, in conjunction with his engineers, devised a new quick-firing gun, and he has just completed a gun of 15 cm., having a length of forty-five calibers. Both the gun and the carriage are of a new type. The construction of the weapon has been retarded, owing to the difficulty of making the cartridges, which are of unusual length; but these are now in a fair way of being finished, and the official trials will be able to take place very shortly. As giving an idea of the capability of this new quick-firing gun, M. Schneider has communicated to members of the French Ministry the following details of a private trial:—With imperfect cartridges the gun realized a speed of 820m. with a projectile of 40 kilos. and fired ten times in seventy-five seconds. The gas pressure was maintained at about 2,500 atmospheres. With the perfection which will shortly be reached, however, M. Schneider thinks that the rapidity of firing will be increased to ten times in sixty seconds, so that they have now a quick-firing gun worked by simple and strong mechanism, which, with the same rapidity of firing, will give a speed exceeding by more than 60m. the maximum figure realized in the most successful trial hitherto made, and this, too, with appreciably less recoil, and without any disturbance whatever from the point of sighting. These things remain to be seen.—*The Engineer*, (London).

Condition and Prospect of the Machinery Business.

LETTERS FROM PROMINENT ESTABLISHMENTS TO THE "AMERICAN MACHINIST."

The Pratt & Whitney Company (Manufacturers of Machinists' Tools, Forging and Finishing Machinery for Sewing Machine and Gun Manufacture, and Special Purposes), Hartford, Conn., write us:

The shipments of the Pratt & Whitney Company in 1891 amounted to $1,100,000, exceeding those of 1890 $50,000; 900 men were employed at the beginning of the year and 850 at the close.

Unless some special orders are received that are now impending, it is not thought that so large a business will be done in 1892 as in either of the past two years, although the completion of a two-story and basement building, about 290 feet long, 45 feet wide, now more than half filled with machinery, has added much to needed facilities for prompt execution of orders for small tools, and incidentally helped the other departments of the business. A storehouse about 80 x 30 feet, of three stories, two boilers of 50 H. P. each, and a 40 H. P. high speed engine have been added to the plant during the year.

Little change has occurred in the price of labor or material. Prices of machinery tend downward.

Standard Tool Co. (Manufacturers of Fine Machine Tools), Athol, Mass., write us:

We are pleased to say that our anticipations of a largely increased business for 1891 have been more than realized, and unfilled orders have continued to multiply, notwithstanding the fact that we have been pushing our works to their utmost capacity, and running some of our departments overtime. Not being prepared for such a volume of business, we at once set about remodeling and improving our tools and machinery, keeping in mind the fact that we must have quality as well as quantity With this in view, we have made some very radical changes during the last year, so that now we are turning out from the same machines nearly, if not quite twice the quantity, and of a superior quality. Still not being able to meet the demands made upon us, and believing it poor policy to cancel orders, we made such changes in the location of our old machines as would give us more floor room. This space was at once filled with new tools. But this gave us no apparent relief, as our books still show a large amount of unfilled orders, some of which date back fully three months. During the past year we have added several new and valuable fine tools to our list, prominent among them being a beam micrometer caliper measuring accurately by .001 up to 6 inches, light steel universal bevel protractor, sensitive surface gauge, and solid steel adjustable square, with bevel.

For 1892 we are now prepared to put on the market a new line of calipers, comprising twenty-four different styles — quick-acting common sense monkey-wrench, improved one-inch micrometer caliper, pocket caliper square, caliper rule, etc. Our prospects for the coming year are most flattering. We have just put on additional help, both in the shop and office. We are now giving employment to a larger number of hands than ever before, and contemplate enlarging our works in June or July, plans for the new building having already been drawn. Prices of labor and materials remain about the same as before reported, while there has been a slight advance on products.

The Orange Machine and Repair Works (Light Machinery, Fine Tools, Dies, Patterns, etc.), Orange, N. J., write us:

Although we have only been in business here since last August, yet we are quite widely known, and have plenty of work, which is owing to the first class work we turn out, and also to the advertising we do in your paper and others.

We have been working overtime lately to complete a large order for special tools to make a new keyless lock, which lock we expect to manufacture next month in large quantities.

We have also had great success with our automatic machines which we have lately made.

The first of the year we will add a larger milling machine and shaper, and the outlook for the next year seems very promising.

Keuffel & Esser Company (Drawing Materials, Surveying and Mathematical Instruments), New York City, write us:

We have pleasure in stating that the increasing demand for our steel tapes and other steel goods has necessitated our adding to our facilities for promptly meeting all requirements. This is very encouraging, as it proves that our endeavors to produce such goods of a high standard of excellence are fully appreciated. The same applies equally to the various kinds of scales which we manufacture, but especially to our *Paragon* scales, which are faced with celluloid.

We have likewise reason to speak with appreciation of the growing demand for our transits, levels and other engineers' instruments, to the construction and improvement of which we have for several years devoted much close attention.

The Lunkenheimer Brass Manufacturing Company (Valves, etc.) Cincinnati, Ohio, write us:

On account of the increasing demand and popularity of our goods we have been compelled this year to almost double our capacity. We have been very busy the whole of this year, and have worked full time.

While prices have not been as profitable as they might be, at the same time we are perfectly satisfied, and all things considered have had a very good year.

We expect the new year to bring about a more substantial and better condition of trade in general, and all we can say is that when it does come we are ready for it.

We are at work now on a new catalogue which we will issue very shortly, and which will be furnished gratis to any one interested in steam brass goods and specialties.

The Bristols' Manufacturing Company (Recording Pressure Gauges and Steel Belt Lacing), Waterbury, Conn., write us:

In response to your favor of the 9th inst. we would say that our sales of recording pressure gauges and steel belt lacing during the past year have been more than double those of 1890.

The prospects for the coming year are very bright, and it is our expectation to build a new factory soon, with increased facilities, in order to keep pace with the growth of our business.

Morse Twist Drill and Machine Company, New Bedford, Mass., write us:

We are glad to add a few lines to the columns of your paper, stating a prosperous business with us the year now closing, and making it necessary through purchase and our own construction to add a number of new machines and tools to our plant. We think the coming year is full of promise in the way of business requirement and activity, and doubt not but that you will be called upon in an increased measure to contribute to the gained general prosperity.

James H. Wells (Machinery, Mill Supplies and Repairs), Tampa, Fla., writes us:

The business in my shop for the past year has been very good; my principal new work is phosphate machinery, and shafting straighteners. Sales in my store have doubled, and I am carrying a much larger stock of metal, supplies, tools, etc. My prospect is excellent for the coming year.

Betts Machine Company (Makers of Metal-working Machine Tools for Railway, Bridge and Machine Shops, and Iron Works generally), Wilmington, Del., write us:

We have added no new buildings to our works during the year just closing. Many improvements have been made in our shop tools to cheapen our product by taking out old tools and replacing them with new ones of improved construction.

The most gratifying increase in our business is shown in the great demand for our improved turning and boring mills, the sales of which have been greatly in excess of any other year.

We hesitate about making predictions for '92, though will say the prospects look encouraging.

Milliken & D'Amour (Mechanical Engineers and Machinists), 151-153 Cedar Street, New York City, write us:

We are pleased to report business with us as being extremely good. We have recently placed on the market a light sensitive drill press which has been favorably received. We are behind on our orders, but have lately added some new machinery to our plant, and expect to keep up with the procession. Our prospects for next year are all we could wish for.

Penberthy Injector Company (Penberthy Improved Automatic Injector), Detroit, Mich., write us:

During the year 1891 from the 1st of January our business has shown a steady increase each month over the corresponding months of the previous year, and our factory has been taxed to its utmost to turn out the large number of machines sold. During the year we have added many lathes to our already large number, and, notwithstanding this increase in machinery, we have not been able to accumulate any stock. We have during the months of November and December made large contracts for the season of 1892 with many of the largest traction engine manufacturers in this country. These contracts run up into thousands of machines, the delivery of which extends from the 1st of January until the 1st of June, thereby enabling the factory to run with full force during the winter months. As every year has been an increase over the previous year, for the past five years, we are now second in the United States in the output of injectors. We look for our usual increase for 1892.

There have been improvements in the method of production, lessening the cost of manufacture, but the reduction in the selling price more than keeps pace with any saving in cost or reduction in the price of material.

Van Duzen & Tift, Cincinnati, Ohio, write us:

We can say that the year now drawing to a close has been the best in our history. We have met with some disaster in the shape of fire in our wood-working department, which occurred in July last, causing a loss of about $5,000, four-fifths of it covered by insurance. Notwithstanding that fact, we have risen, Phœnix-like, *through* the ashes, completely improving our works, and within four months added another improvement in the shape of a newly fitted up bell foundry, doubling our capacity, improving facilities by putting in new machinery, new engine and boiler, and are fully prepared to meet double the demand of former years. It has not been done on a wild venture, but is the result of necessity; for during the year the demand for our bells has doubled, and we are most satisfactorily supplying all who may call on us. Your adevrtising columns have helped in this progress, for our business in our superior patent steam jet pumps and other machinery specialties has also kept pace in the onward march. Cost of labor has been about the same or somewhat higher than previously, as we do not believe in depressing cost of labor if we can avoid it, since we consider labor a handmaid to capital, and we try to harmonize the interests of both, to secure mutually satisfactory results.

We are still at the old stand, increased by 100 per cent., where we have been for past 54 years, and from which we have sent out over 20,000 bells to nearly all parts of the world, and are better prepared now to meet all demands, at the closest possible figures for good, reliable work, than ever before. We are supplying the best and cheapest reliable pump in the country, pumping from 300 to 14,000 gallons of water per hour each. Parties requiring anything in our line will do well to correspond with us and investigate the merits of our goods before buying, and may rest assured we will give them prompt and courteous attention and full information.

Hill, Clarke & Co. (Iron and Brass-working Machinery), Boston, Mass., write us:

The year began with a continuation of the great business of the year before, but this fell off during last summer.

It has now begun to improve again, and there is every sign of activity during the next year.

For ourselves, we cannot complain of the present condition of business; our special interests show most satisfactory improvements, and the shops of Flather & Co., and the Brainard Milling Machine Company, etc., are running full time and give continued evidence of the appreciation of the public for good work.

McGrath & Collins (McGrath's Patented Yielding or Rigid Journal Bearings, Self-oiling and Dust-protected, Grinding, Polishing and Buffing Machinery), Cohoes, N. Y., write us:

We are pleased to say that our grinding, polishing and buffing machinery is fast coming into general use. Our machines are working their way gradually into the large stove and plow works. Small consumers have also discovered that these grinders or polishers, which will balance their wheels, keeping the same true until worn out, and also preventing jar and shake to machine and building, are of great value to them.

We have a large number in use in the West. The Paris Stove Works, of Sioux City, Iowa, use our machines exclusively. Hillman Plow Company, of Evansville, Ind.; Selby Starr & Co., manufacturers of agricultural implements, Peoria, Ill., and many others, too numerous to mention, award our machines the highest praise.

We are now turning out our work in larger quantities, enabling us to sell at a lower discount than heretofore. We produce the best of work, the arbors being steel, and the bearings being self-oiling and protected from dust. It is our intention to exhibit our machinery at the World's Fair at Chicago in 1893, feeling confident of carrying off the first prize.

Chandler & Taylor Company (Engines, Boilers, Saw-mills, etc.), Indianapolis, Ind., write us:

We can say that during the year of 1891, counting it as a whole, our business was fully up to the previous year.

The past two months have shown somewhat of a falling off in direct orders, but the inquiries since that time seem to be more numerous than any time during the past year, making the prospects for the year 1892 more than flattering.

We are running our works at full capacity, in anticipation of the trade in 1892, and expect to realize during that year a larger trade than we have had for many years. Within the past year we have added to our works a large and fully equipped boiler plant for the manufacture of steam boilers, in which we are prepared to make all sizes and styles of boilers, under the most approved methods of production. In our other departments we have added largely to the machine tools, especially in the line of special machinery, and are better equipped to-day than ever before in our history for the manufacture of our standard engines, boilers and saw-mills.

The prices of labor during the past year heve remained stationary, although the price of materials has within the last few months declined materially.

Mason Regulator Company (Steam Regulating Specialties), Boston, Mass., write us:

Our trade has been very steady during the year; in fact, for the last three months we have been compelled to work evenings, and even then cannot keep up with our orders. We are now several weeks behind our orders, and they are still coming in somewhat faster than we can fill them, with our present accommodations. We have been expecting all the fall that a let-up would come, and have, on that account, rather hesitated increasing our plant; but from the present outlook it seems to us that we shall have to materially increase our facilities, especially as we wish to put upon the market one or two new devices. During the past year we have put upon the market a piston throw indicator for air-brakes, and a brake beam clamp, also a device for air in connection with our air brake regulator, which regulates the air-brake pump on the locomotive, either from the air reservoir or the train supply pipe. This is something that has long been wanted by railroads, and from present indications it seems as if it would be satisfactory. We have also, during the past year, established a brass foundry, in which all our composition castings are made, and we find a great saving thereby, besides getting rid of the annoyance of waiting for castings when we are most hurried.

Our most noticeable increase during the year has been in our air-brake regulator and locomotive reducing valve. The former has been adopted as the standard by the three largest railroad systems of this country, besides about fifteen smaller railroad companies. On the latter we still seem to hold our own, and we can see a marked increase. In fact, we state that in all of our goods this year has been the best that we have had, and the prospects for the coming year are the brightest.

C. F. Langston & Co. (Engineers and Machinists, Jewelers' and Silversmiths' Polishing Lathes, Dies, etc., Cutting, Forming and Stamping Dies—Can Makers' Tools a Specialty), Philadelphia, Pa., write us:

Our business progress for 1891 has been very encouraging—prices as to labor, product and materials, remaining about the same. Considering the amount of orders on hand, the prospects for 1892 are specially encouraging, as we contemplate taking another building after the first of the year, in addition to the one we now occupy.

The Ball & Wood Company (Ball Automatic Cut-off Engines, Simple and Compound), New York, write us:

This year to us has been largely one of preparation for building our Improved Ball Automatic Cut-off Engines. On March 1st our site was an unbroken level field of about five acres, near the railroad station at Elizabethport, N. J., and contracts had been let covering the completion of our buildings and the delivery of tools and equipment on June 1st. On July 1st our shops were occupied, and many tools in operation, thanks to the energy of the Berlin Iron Bridge Company, the building contractors, and to the Niles Tool Works, Hill, Clarke & Co., Pond Machine Tool Works, Wm. Sellers' Co., Betts Machine Co., Newton Machine Tool Works, The G. A. Gray Co., Gleason Tool Co., and others, to whom it gives us pleasure to acknowledge our obligations for their courtesy and promptness. In August, the Shaw Electric Crane Company, through their representa-

tives, Manning, Maxwell & Moore, completed the erection of a fifteen-ton electric crane, and on September 1st we were building engines. Early in October our first Improved Ball Engine, of 150 horse-power, was tested and shipped to the Edison General Electric Company, at Trenton, for use in the capitol building, it being one of the conditions of this sale that the engine should be built entirely in the State of New Jersey. This shipment has been rapidly followed by others, and now, at the close of the year, we find ourselves thoroughly equipped for building simple and compound, condensing and non-condensing engines, not only in the best manner, but at the least expense. Situated, as we are, within ten miles of the City Hall in New York, with Newark and other large manufacturing centers close at hand, we find our labor supply not only abundant, but excellent.

The outlook for 1892 we consider good. Our order book shows fully two months' work in advance, and we have found it necessary to run our works all night for the past two months in order to meet the demand for our product.

Chas. A. Strelinger & Co. (Hardware, Tools and Supplies, Machinery), Detroit, Mich., write us:

We beg to inform you that our business for the past year has been fairly good. Our gains for the first nine months of the year were considerable, but the past three months have shown decrease. We believe this lull is but temporary, and that we are justified in expecting better things in the year that is to come.

Pancoast & Maule, (243-245 South Third Street, Philadelphia, Pa., write us:

We have your circular letter of 9th, and note contents of same, but somehow do not find ourselves able to contribute anything of interest (presumably even) in the line sought. Mere "padding," we both recognize, has no place in the AMERICAN MACHINIST, and we think but few would seek it there. Very small, indeed, would the number be who would care to learn that we found trade sluggish, and perforce competition keen in this year of grace 1891; and so many, we trust, feel as we do—hopeful for 1892—that such aspirations (in print) would savor strongly of a "Castanean" flavor. We are glad to see you evidently reaping where you have well and wisely sown—facts that cannot be concealed from regular readers of your altogether admirable paper.

Harrison Safety Boiler Works, Germantown Junction, Pa., write us:

We are glad to be able to report a very satisfactory year's business, the volume of which is considerably in excess of that of any previous year of the past twenty-eight years during which the Harrison Safety Boiler has been manufactured.

We also have more unfilled orders now on our books for future delivery than we ever had before at the first of the year, and we anticipate a still further increased business in 1892.

Lackawanna Lubricating Company (Cylinder Lubricators and Grease Cups), Scranton, Pa., write us:

Replying to your letter of the 9th inst., would say that our business has increased to such an extent during 1891 that we found it advisable to erect a machine shop and foundry and do our own manufacturing. Although our shop has been in operation but a month, we are already obliged to put in additional machinery in order to catch up on back orders and be prepared for the large amount of work we see ahead of us. Since our goods were first placed on the market—a little over three years ago—they have steadily grown in favor with machinery users generally. We have made a number of improvements in our cups during the year, and now, with first class tools, operated by skilled workmen, we are in position to turn out work that will compare favorably with that from any shop. We are strongly opposed to the policy of sacrificing quality for the sake of cutting prices and thus gaining temporarily a little more trade. Men constituting the engineering class are quick to discover defects in principle or workmanship, and as a rule are firm believers in the old adage, "The best is the cheapest." Confining ourselves to our own specialties, we are able to give them that close attention which insures success.

The outlook for 1892 in our business is very encouraging, and we believe that during the coming year great prosperity will be experienced in all lines of trade. As a nation we are rapidly forging ahead, and there is no reason why we should not lead all nations of the earth in everything that goes to make a great and prosperous republic.

We are again pleased to express our entire satisfaction with the results of advertising in the AMERICAN MACHINIST.

R. M. Clough (Cutters for Gears, etc.), Tolland, Conn., writes us:

Business with me has been very fair, taking the year 1891 through. I am intending to make some changes in what I manufacture soon. I shall put on the market soon a gear cutter of which one cutter will cut a pitch of interchangeable wheels from eight teeth to a rack, inclusive, which can be used on machines for cutting gears now in use. The teeth which this cutter makes are involute and variable in shape, and will run with those generally now in use. A little later I shall send you a description and cuts, for publication in the AMERICAN MACHINIST. I see no reason why business generally should not be good for 1892.

Worcester Chuck Co. (Lathe and Planer Chucks), Worcester, Mass., write us:

I began about one and one-half years ago to make my dust-proof lathe chuck, and since have added planer chucks, and 13″ upright drills; have had orders from users for lathe chucks, but none from dealers, but have had good trade in planer chucks and drills from them. I have not kept up with my orders. I have just added one 22″x10′ engine lathe, one 24″ back-geared automatic feed upright drill, and one 13″ lever upright drill. I have plenty of orders. Prices about the same as one year ago with some exceptions, which tend to lower rates. Wages the same. Outlook for '92 good, but profit small.

A. W. Jacobi (Consulting Mechanical Engineer), 136 Liberty Street, New York City, writes us:

The first three-quarters of the present year business was fully up to expectations; the closing quarter, however, has been quiet.

This I attribute to the unsettled condition in the financial world. The public, and more especially those contemplating the erection of plants, are gradually awakening to the fact that it is to their advantage to employ an engineer when engineering matters are involved, instead of intrusting them to the architect, as has been, and still is, in a great measure the custom. Judging from present indications, I expect to be kept very busy during the coming year, designing and constructing both power and manufacturing plants.

The Meriden Machine Tool Co. (Machine Tools and Brass-working Machinery), Meriden, Conn., write us:

We have every reason to be well pleased with the success of our business during the year just about to close.

We have during this time increased our capacity 25 per cent., yet have been and are still pushed for our products, with inquiries coming in at the present time more numerous than ever.

We have been thus far working under many disadvantages, being in rented quarters, without conveniences, but have now under way, with prospect of speedy completion, a building designed to meet our requirements, which we think will enable us to fill our orders in a more satisfactory manner to all concerned.

Springfield Machine Tool Company (Manufacturers of Brass and Iron-working Machinery, and Iron Founders), Springfield, Ohio, write us:

Our business for 1891 has been one of continued prosperity and activity. The addition to our regular goods of a superior line of adjustable power presses, of which we are at present making seven sizes, has been so successful that we shall enlarge our machine shop in the spring. The foundry department has been increased this fall by two additions, one of brick and one of frame, and we are just completing a 10-ton crane, which allows us to handle any size casting for our trade, which has doubled on us this year. Our wage list remains about the same, with more ease in getting it. We therefore confidently look for an active business in 1892.

J. & J. B. Milholland (Wire Rope Haulages, Steel and Iron Wire Rope, Steam Engines and Light Locomotives,) Pittsburgh, Pa., write us:

Our business during the year 1891 has been quite satistactory. We have had about orders enough to keep our facilities in quick motion during the entire year, with fairly satisfactory margins, and have orders now in hand to run us well into the month of March or April, 1892. We have added to our facilities about $10,000 in the way of new machine tools, which will enable us to do quite a good deal more work in the same length of time. We are paying our help about the same as we did a year ago, and are feeling quite hopeful for the year's business in 1892, in consequence of the enormous grain crops of the present year. In fact, we think we can already see its effects approaching, in the way of many large orders for steel rails and other materials having already been placed.

Keystone Engine and Machine Works, Wm. L. Simpson (Machinist and Engineer), Philadelphia, Pa., write us:

We are happy to say our sales for steam specialties are steadily increasing up to this date, at the rate of 50 per cent. over same time last year. The improvements adopted recently permit us to accumulate stock and fill orders more promptly.

While the average of profit may be decreased, the increased output more than doubles our former production; as jobbing machinists we hold about same as last year.

We note no change particularly in supplies, etc.

New Haven Manufacturing Company (Machine Tools), New Haven, Conn., write us:

Our business has fallen off quite a little during the past year as compared with that of 1890. However, we have been able to run our establishment upon full time and with the usual number of hands, and feel encouraged, for we think, from the present outlook, that we shall undoubtedly be able to continue doing so. We have made no particular enlargements to our works during this year, other than to add a number of new tools and making some improvements about the works. The outlook seems to be fairly encouraging for a good business in the near future.

The Norton & Jones Machine Tool Works (Machine Tools and Special Machinery), Plainville, Conn., write us:

Business is very good and prospects are good for coming year. We have just received a very large order from France. Our export trade is increasing wonderfully; also home trade.

We have done double the business this year that we did last.

Hilles & Jones Company (Manufacturers of Machine Tools), Wilmington, Delaware, write us:

We are pleased to inform you that during the past year we made considerable addition to our plant. Among other things, we put in a large planer which will plane 11½′ wide and 30′ long; this, in addition to a thirty-ton, three-motor electric traveling crane, which is about ready to be erected, enables us to handle the heaviest work in our line. We were very busy during a considerable portion of the past year, with good prospects for the opening of the new year. Inquiry during the last two or three months has not been as brisk as we should like. We have extended our line of machine tools very considerably, and are now prepared to build standard or special tools of large capacity. We are building now a heavy punch and shear, with capacity for cutting 4½″ square billets cold; also built a punch within a few months that will punch 6″ holes in ½″ steel in the center of 10′.

Warren Webster & Co. (Williames' Vacuum System of Steam Heating, without Back Pressure upon the Engine; Vacuum Exhaust Steam Economizer, Feed-water Heater and Purifier, etc.), 491 North Third street, Philadelphia, Pa., write us:

Our business this year has doubled that of 1890, and has been exceedingly satisfactory. We are now placing more salesmen on the road, and the prospect for 1892 is such that we anticipate doubling our sales of 1891. Our prices are lower than they were in 1890, and we have just obtained exclusive control in the United States for the sale of the "Williames Vacuum System of Steam Heating," and show a cut representing our "Economizer" and the "Williames System," working in combination, upon the enclosed circular, by the combined use of which, we claim to be able to effect a greater saving of coal and power by utilizing exhaust steam for heating and purifying feed water for steam boilers, and utilizing waste exhaust steam for heating buildings, without back pressure, than any method as yet known, and if we fail to show better results we will make a forfeit of a certain agreed upon sum of money. We have placed both systems in the largest works in the United States (as may be seen by references on the back of circular), and have more orders booked than we are able to fill this year.

The foreign patents of the "Vacuum Exhaust Steam Economizer" have been sold to a European syndicate, headed by Sherman & Co., Antwerp, Belgium. The said company have made practical tests of sample machines which we have sent them.

We are very much pleased with the results which we have been getting from our last advertisement in your paper.

Frank H. Clement Company (Wood-working Machinery), 330 to 340 Lyell Avenue, Rochester, N. Y., write us:

Your favor of the 9th, asking for particulars about the condition of our business, is at hand, and in reply we would say that our business has been constantly increasing every year for the past fifteen years; that it has nearly doubled since we moved into our new quarters, Nos. 330 to 340 Lyell avenue, and the outlook for the future has never been better.

We have orders ahead which will keep our works running for two months at least, and are constantly getting out new designs and improving old ones, and putting on the market machines of a higher character than we have ever done before.

There have been no special changes in the price of labor or materials generally, with the exception of a slight drop in all grades of iron and steel, including castings. Prices on what would be called staple wood-working machinery, such as planers, saws, lathes, boring machines, etc., rule very low, in consequence of the cutting of prices by makers of cheaper work, but we find that there is always a certain demand for good workmanship and well-designed, heavy machines, and we expect to be able to hold our own on this class of work.

The Gordon Steam Pump Company (Duplex Steam Pumps, Water-works Pumping Machinery), Hamilton, Ohio, write us:

Our business for the past year has been very satisfactory, being much larger than ever before. We have recently completed a large addition to our machine shop, 80′x160′, and have equipped the same with a 10 ton power traveling crane. We anticipate a large volume of business the coming year.

Warner & Swasey (Designers and Manufacturers of Machine Tools and Special Machinery), Cleveland, Ohio, write us:

Until the middle of the year just closed we were crowded with orders to our fullest capacity. During the warm season there was a slackening of business, but the fall trade came in with its usual complement of orders, and all indications point to a very prosperous year for '92. We have already commenced extensive additions to our buildings, and shall greatly enlarge our facilities during the year.

We take pleasure in inclosing a list of thirty-one of our employes who wish your valuable paper for the ensuing year.

The Albany Steam Trap Co. (Return Steam Traps, Pumps and Pump Governors, Water Filters and Phosphor Bronze, Renewable Seat Stop and Check Valves), Albany, N. Y., write us:

Our entire business has been larger than last year, our return steam trap branch having been about the same, with the automatic pump and pump governors a little in the lead of last year's sales. Our duplex water filter business has largely increased in the volume of business and number of sales made. We consider the prospects for business in our goods for the coming year good. We desire to acknowledge the value to us of the AMERICAN MACHINIST as an advertising medium. Not only do we have inquiries from all parts of the United States that mention the AMERICAN MACHINIST as the source of the information relating to our goods, but from many foreign countries besides; and within the past month we have received (and shipped the goods to fill the order) an order from a celebrated engineer of Kharkoff, Russia—this order we can trace directly to the AMERICAN MACHINIST.

The Hayden & Derby Mfg. Co. (Metropolitan Automatic Injectors), No. 111 Liberty Street, New York City, write us:

Responding to your inquiry regarding our business for the past year, for publication in your valued paper appearing for 1892, would state that our past year's business has been highly satisfactory. Our business has doubled in extent, and our products are now sold from the Pacific coast to Maine, and in use with the best engineering establishments in the country. We have established ourselves by a series of practical tests made in competition with our leading competitors, and secured our place in the trade entirely upon the merits of our machine, and we feel that our growth is of a very substantial character.

W. P. Davis (Dealer in Machine Tools, Metal-working Machinery), Rochester, N.Y., writes us:

My business was exceedingly good at my machine tool works up to about the 1st of

July, and sales at my machinery store were good until September 1st, after which time my entire business was very dull for about 60 days. About November 1st, however, business at both places commenced to pick up, especially at the store, and I am now having a very nice trade. I have brought out during the past year a number of new tools, making two sizes of cutting-off machines, also a milling machine for general machine shop use and an automatic surface grinding machine. My correspondence has been increasing materially for the past two months, and my mail is the largest at the present time that I have ever had, showing conclusively that people are looking after machinery, and there is every indication that in a very short time business will be very good. I don't look for any boom in business, but can see no reason why it will not steadily improve from the first of the year, all over the country, and I believe when spring is fairly opened we will see a very prosperous condition in the machinery business.

Eureka Tempered Copper Company (only Manufacturers of Pure Tempered Copper), North East, Pa., write us:

As our business deals entirely with a specialty in which we have no competition, it would hardly be fair to make any estimates as to the general business outlook from our statements.

During the year 1891 we have progressed rapidly and doubled the monthly output, and prospects were never brighter in any line of business in the manufacturing line than ours are for 1892.

During the year we have added to our factory, which was already large, another molding room, 50x140 feet, with asphalt paved floor and slate roof, we finding it necessary to add that much to our present facilities. We have also added a room where we are making a specialty of making commutators for the electrical trade from our tempered copper. We make them, however, only for the systems who have not adopted our metal for this purpose, and whose customers are asking for tempered copper.

We have, on an average, about sixty orders ahead of us each Monday morning.

Our increased capacity has cheapened to a great extent the cost of the production of our metal. There have been but trifling changes in the price of labor and product, and the material which we use, being exclusively Lake Superior copper, has been low for several months.

We believe that these annual reports from manufacturers are productive of much good.

The Hoggson & Pettis Manufacturing Company (the Sweetland Chuck, Standard Safety Punch, the Porter Belt Clamp, the Morris Typewriter, Cutting Dies, Special Machinery, Stamps—all kinds, Stencils and Supplies, Roll Engraving, etc., etc.), New Haven, Conn., write us:

In reply to yours of the 9th, we beg to say our business for '91 has thus far been most satisfactory. We have added new machinery from time to time through the year, and will increase our motive power by the addition of a 65 horse-power Corliss engine within a short time.

The volume of our business is largely increased over last year; our sales in the chuck department up to December 1 being over thirty per cent. greater than last year's business.

The outlook for a prosperous year during '92 is particularly good.

John S. Leng's Son & Co. (Importers of and Dealers in Iron and Steel, Weldless Steel Tube Company's Patent Weldless Cold Drawn Steel Tubes, Leng's Improved Lever and Cam Valve, Portable Railway Syphon, Lansdell Patent Steam Syphon Pumps), New York, write us:

Our business, especially in weldless cold drawn steel tubes, shows a gratifying increase each year. We attribute a part of this increase to the convenience our friends among the machinists find in our keeping a great variety of sizes *in stock*. From $\frac{3}{8}$" to $2\frac{1}{2}$" outside diameter, we keep all the $\frac{1}{8}$s in stock and advance by $\frac{1}{4}$s to 4", so that they are able to find usually the exact size needed.

Wiley & Russell Manufacturing Company (Lightning and Green River Screw Cutting Machinery, Screw Plates, Taps, Dies, Reamers, etc), Greenfield, Mass., write us:

The year 1891 has been a time of unusual development with us, our business having so far outgrown our accommodations as to make extensive enlargements necessary. We have more than doubled our old plant. During the same time important additions have been made to our line of manufactures—new patterns of opening, die bolt cutters and drilling machines, additional assortments of Lightning and Green River screw plates, both for bolts and for pipe work, new spiral fluted shell reamers, etc., etc., as set forth in our new catalogue.

The demand has been remarkably good, and we partake of the general expectation of a good year to come.

Prentice Bros. (Machinists' Tools), Worcester, Mass., write us:

Our year's business has been entirely satisfactory. We have increased our facilities by the enlargement of our works and addition of improved machinery to the existing plant.

Noting a lively inquiry for tools, which usually precedes a demand, we consider the outlook for trade very encouraging.

Charles Churchill & Co., Limited, 21 Cross Street, Finsbury, London, E. C. (Engineers and Importers of American Machinery), write us:

We have pleasure in saying that during the past year the demand for American machine tools, which we are introducing in Great Britain and on the Continent, has steadily increased.

The tools that we find ready sale for are the milling machines, lathes, drilling machines, shaping machines, etc., of all of the best manufacturers. The decided advantages of American tools are being realized by many of the English manufacturers, who find that a greater amount of work can be done with the American tools than with those previously in use.

The class of manufacturers who are now extending their works very largely embrace the electric light, bicycle and gun trade. Our sales in all of these classes are decidedly in advance of any previous year, and the prospects for the new year are most favorable in every respect.

In addition to machine tools, we also have found a large and growing trade in small tools, such as chucks, drills, vises, gauges, micrometers, and all of the highest class of tools.

Watson & Stillman (Engineers, Manufacturers and Machinists), New York, write us:

We have pretty much the same report to make as last year. We have added and are adding quite a large number of tools to our lines of manufacture. We have added probably more in the last year than in any two previous years, and had to add quite a little special machinery, and have at the present time more orders on hand than we had at the corresponding time last year, and anticipate a good year's work.

Leland, Faulconer & Norton Co. (Machinery and Tools), Detroit, Mich., write us:

We are glad to say that our business for the past year has been very good. Have sold a considerable number of our machine tool grinders, and our gear cutting business has been large and quite satisfactory.

We have as well a great deal of special work on hand, designing and perfecting new machines, both for ourselves and others.

The outlook for 1892 is very good, and we have every reason to hope for a prosperous year.

Joseph Dixon Crucible Co. (Graphite Paint, Pencils, Crucibles, etc.), Jersey City, N. J., write us:

No special message. We are happy. Have worked hard. Competition has increased beyond anything before known. Still we live.

Audubon Machine Works (Builders of the Woodruff Patent Separating Machine, and General Machine Work), New Haven, Conn., write us:

We have had a fair amount of business during the past year, and consider the prospects good for the coming year. We can, however, increase our output without enlarging our works.

Sales of our principal specialty — the Woodruff Patent Separating Machine—have exceeded our most sanguine expectations, and every buyer is happy.

Boynton & Plummer (Upright and Horizontal, Hand and Power Self-feeding Drilling Machines, Hand and Power Bolt Cutters, Hand and Power Shaping Machines, etc.), Worcester, Mass., write us:

While business with us the past year has not been quite equal to the two or three previous years, we feel quite content, as we believe we have not suffered on account of any disparagement in the standard of our tools, but more on account of the decline in business generally. We strive to keep our tools the standard in their line, knowing that when there is any business we can command a share of the best trade, on account of the superiority of our goods.

We believe that the check given to business in the past year has been owing to the severe contraction in credits, caused by the pinch in the money markets, and we can see no prospects of any material improvement in the near future, until there is a relief given in some way in that respect. The only prospect we can see for any change in that line, though quite limited, is in the free coinage of silver, which would give more money, stop the contraction of credits to a certain extent, and allow an expansion of business on a money or cash basis, instead of so much credit basis; for on a credit basis the bubble must burst periodically.

This may be an essay on finance, nevertheless it is the basis of business prospects.

E. & F. N. Spon & Co. (Publishers of Scientific Books), 12 Cortlandt Street, New York City, write us:

We have nearly ready the fourth edition of Thompson's Dynamo Machinery, for which we have a large number of orders already. We have also just issued a new book on Roll-turning, by Spencer, and Vosmaer's Mechanical and Other Properties of Iron and Steel.

The Hackney Hammer Co., Cleveland, Ohio, write us:

While the past year has been said to have been a very dull one in the machinery line, yet this company, in presenting a new tool to the trade, has done very well.

We may say we have been in the market only since the first of the year, and in the last six months our business has been very good, having disposed of our production as fast as our facilities would allow us to get same out.

The trade seem to have been very cautious and close buyers; in the last month, however, we have noted a slight change, and the prospects for '92 are very good.

S. W. Card & Co. (Taps, Dies, Reamers, etc.), Mansfield, Mass., write us:

The past year has been a fairly prosperous year with us. We have added somewhat to our facilities for manufacturing during the past year. We think the outlook for 1892 to be as good, if not better than 1891.

The changes in labor, material, etc., have not been noticeable to any great extent.

Cleveland Twist Drill Co., Cleveland, Ohio, write us:

The year 1891 has been, all things considered, a very satisfactory year to us. In December of 1890 we purchased a lot on the corner of Lake and Kirtland streets, with a street frontage of 100x330 feet, we occupying a building of 100x35 feet. In June of 1891 we put on an addition to the building of 125x40 feet, three stories high, more than doubling our floor space. We shut down the factory for three weeks to rearrange all of our machinery, and by July 1st were running again under the new arrangement. We have added machinery as fast as we could build it, and have increased our facilities during the year, so that we are now able to turn out fully 75 per cent. more work than a year ago. Our orders have kept up to our capacity, and the appearances are that we will be pushed to fill our orders for 1892 There has practically been no change in the prices of our product during the year, nor in the prices of raw material or labor.

Thomas Wrigley (Engineer and Machinist), Chicago, Ill., writes us:

I am pleased to state that my business for the past year has been very satisfactory, and the outlook for the year 1892 looks very encouraging. The sales of my new emery wheel dresser have been very large, a large number of the leading manufacturers having made it their standard tool. Recently I have added a number of improvements to it, especially size No. 1, making it a tool for general work. By using one cutter in center, which can be used right or left, emery wheels can be grooved, sharpened, rounded, or any shape desired can be obtained. And by displacing two steel collars, and putting in two other cutters, making three in all, emery wheels can be faced off true and flat on face, and this can be done more rapidly than ever before. I have also introduced a larger size with six cutters for facing off very large emery wheels and grindstones, and a bracket dresser for trimming off emery wheels in knife-grinding machines. Another new feature is an emery wheel dresser with a single cutter, to be used in tool-post of lathe.

This is a very useful tool to trim sides of worn-out emery wheels; by gripping them in chuck of lathe they can be brought down flat and true, and much better than if done on grinding machine.

I have made sales in Europe, and have received letters pertaining to my emery wheel dresser from England, Germany, France and Russia, which is the best evidence that your valuable paper is read and appreciated in other countries than our own great United States.

Jeanesville Iron Works, Jeanesville, Luzerne County, Pa., write us:

The last ten months of current year have been all that we can ask, and we now have orders on our books which will keep us fully employed until March, 1892.

We have made a good many minor improvements during the last year, including the addition of an 800-pound steam hammer for our smith shop, and a new set of plate bending rolls for boiler shop.

Next year we intend to enlarge our foundry and put in an additional crane.

Our mine pump business has grown very rapidly this last year, compelling us to add a number of new sizes to our already large list. Judging from the number of orders we already have on our books, together with the known wants of our regular customers, we consider the prospects for the coming year as very promising.

Hollands Mfg. Co. (Hollands One-Piece Fuel Gas Burners, Gas Stoves, Plumbers' Tools, etc.), Erie, Pa., write us:

Our general business has been rather slow last fall and summer, but our total sales will show an increase for the year, owing to our growing trade on vises. We have added to our list during the year the machinists' offset jaw vise, which has found a ready sale. For the ensuing year we are building a two-story brick addition to our finishing department, and anticipating a good year in our line. Cost of labor and material unchanged.

Edward Meeks, Publisher, No. 1012 Walnut Street, Philadelphia, writes us:

The sale of works on steam engineering published by me has been very large during the year past, especially through the Northwest.

I can attribute the demand to advertisement inserted in your valuable paper. I think I can say without exaggeration that 33⅓ per cent. of mail orders have come to me through my advertisement in your paper. Prospects for the coming year are bright.

The Detrick & Harvey Machine Co. (Open Side Iron Planers and Special Machinery), Baltimore, Md., write us:

During the past year we have increased our facilities, as the accumulation of work demanded, by many new tools.

This has been necessary, owing to the increasing demand for the open side planer, to which specialty we have given much time and careful attention, and which is daily increasing in popular favor.

We have also been busy on some gun machinery for the Watervliet Arsenal, New York, and a great variety of special work, including tobacco machines and ice machines.

The prospect for the new year is extremely encouraging, and we have sufficient orders in hand to justify our great expectations. We are working three nights in the week, and with our increasing facilities expect to do more work than ever before.

A New Grindstone Frame and Truing Device.

In the question of grindstones *versus* emery wheels, for use in general machine shop work, both will have their advocates and their use. No doubt the discussion has led to more observation on the part of the users, it has led to the improvement of the emery wheels and their machines, as it has led to a better show and treatment of the grindstone. It would be as impractical to grind pocket cutlery on an emery wheel as to polish the same work on a grindstone. In the machine shop, with both at their best, very likely each would have men favoring each, and when the demand comes for the best, machines will be provided which will likely bear as little resemblance to the old wood frame as the present slide rest lathes do to the old wood-bed hand lathe.

The grindstone frame with attachments shown on the succeeding page is manufactured by D. F. Walker, corner of Front and Canal streets, Philadelphia, Pa., and possesses some points of merit worthy of consideration.

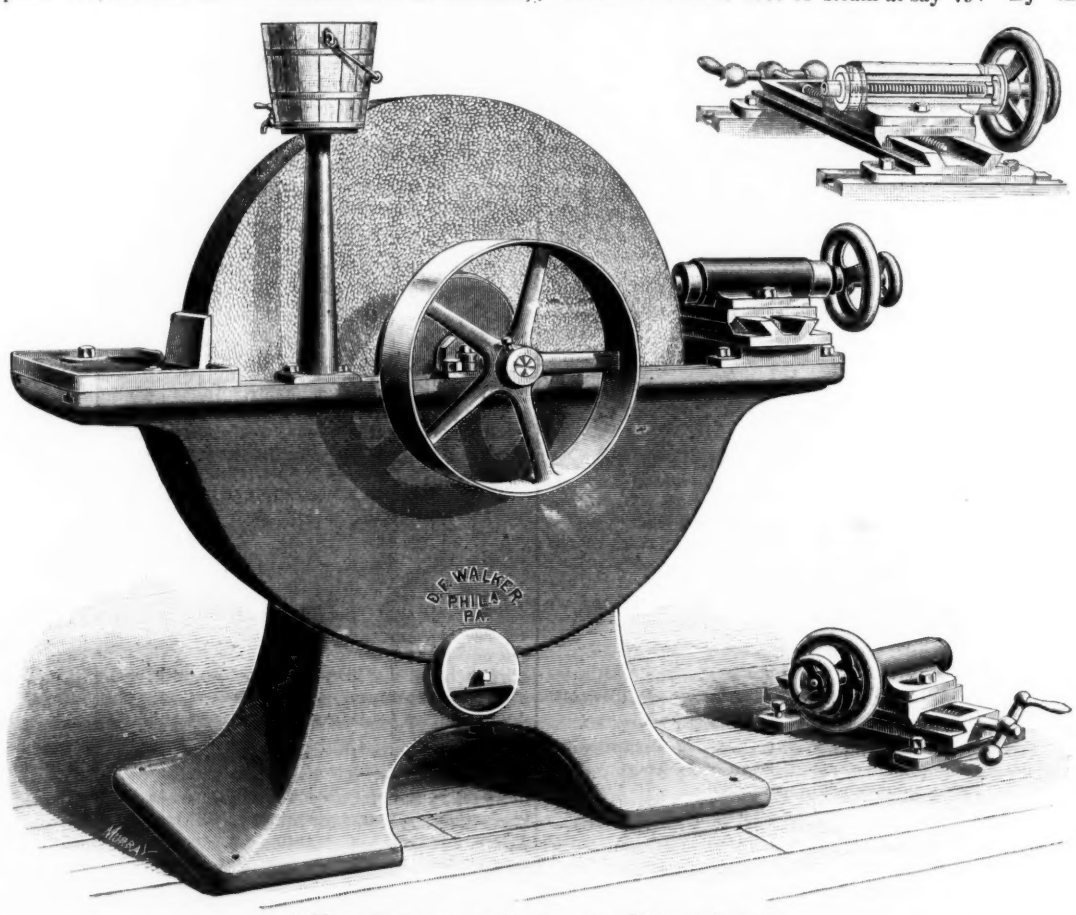
Running along each side and at the top

of the frame are T slots, to which are fastened both the rests, the standard upon which the water tank is held, and the boxes as well. The result of this arrangement is that all these parts are adjustable, and that as the stones become small they can be moved forward in the frame, so that the grinding point occupies the same convenient position as at first, and all the other attachments can be adjusted to it. And since it pays to put on a smaller pulley to run a stone at higher speed as it wears down, the belt is easily accommodated to the new position at the same time.

It is possible by this arrangement also to put two small stones into the frame, arranged one in front of the other, their character being varied to suit different work, if desired, or one of them may be an emery or corundum wheel.

The box with its supports is cast in one piece, the opening near the bottom for cleaning being closed by a plate, which is fastened by a single central boat, so arranged that a half turn of the plate loosens it.

The truing device is a new one, and seems to be an adaptation of the familiar gas pipe used in the hand, which is a time-honored and very effective tool for the purpose. In this, the tool is tubular, and held in such a manner that it can be revolved by the larger of the two hand wheels, and moved to or from the stone by the smaller one. It is traversed across the stone by means of the screw and crank handle. Such a tool is, of course, equally efficient at all times, and when worn out is easily replaced. Any form which can be given the stone by hand turning can of course be given it by this device, and it can also be turned practically straight, which is not easily done by hand. The shaft boxes have covers designed to keep out dirt.



A NEW GRINDSTONE FRAME AND TRUING DEVICE.

LETTERS FROM PRACTICAL MEN.

A New Steam Engine.

Editor American Machinist:

Readers of the AMERCAN MACHINIST will be interested to hear that a novel method of steam engine working is claimed to be discovered in England by one Field, the basis of which is the admixture of heated air and steam in a reservoir, prior to its admission to the cylinder.

Those interested claim this as the greatest discovery since that of Bessemer steel, and it is publicly stated that the Rothschilds have secured the patents for four European countries for 2½ million dollars, subject, however—an important limitation—to the success of trials to be made with a 200 horse-power engine which is being built to test the system, by Musgrave, of Bolton. Further, that for working the English patent a five-million dollar company is being formed, and already half a million dollars has been provided to exploit the whole business by the syndicate of Lancashire and Yorkshire manufacturers who have taken the matter up and are having the proposed test made.

There always is a *syndicate* mixed up in these matters, though my own experience leads me in the majority of cases to lay the heaviest stress on the first syllable.

Syndicate seems to be a term that sticks. It has a special and peculiar significance of its own, like "that blessed word Mesopotamia."

Anyhow, wherever there is a syndicate there will the sanguine investor be found, properly guarded, too, by the vultures which watch the investor when he sleeps, much as Darwin describes the habits of such birds in his writings.

However, I do not know that the present discovery savors of such things, though it is probably too sanguine.

The admixture of steam and heated air saves, it is said, 60 per cent. of the water used by a steam engine and an equal amount in fuel, and the invention can readily be applied to existing engines. Sixty per cent. sounds well. It means that an ordinary cotton-mill engine will use six pounds of water per hour per horse-power, or less than three-quarter pounds of coal per horse-power per hour.

Presumably it is to pressures under 100 pounds that it will mostly apply.

Put briefly, it is said that one volume of steam introduced to eight volumes of air at 400° will produce more power in a steam engine than ten volumes of steam, and that all the heat of the air will come from waste heat of the furnace. I have even heard it said that it will be actually the furnace gases that will be employed.

The above looks like a saving of 90 per cent., but only 60 per cent. is claimed, and we may suppose that the difference of 30 per cent. is used up again in doing the air pumping and in sacrificing the power of condensation; for, though not stated by my informant, I think we may take it for granted that a steam engine using "steam" of which nine-tenths is non-condensible will not need to be burdened with a condenser, or will require an air pump of very large capacity, for there is to be used every stroke as much air as will fill half the cylinder at 400°, and if rejected at as low as 200° its volume would still be large—nearly four-tenths that of the cylinder.

There is to be a chamber for each end of the steam cylinder of half cylinder volume, and from the description, which is vague, it appears that each chamber is to be filled with air while the other end of the cylinder is working. Then steam is let in, and at the proper time communication is opened with the cylinder and the mixed charge expands against the piston. At the end of the stroke comes the usual exhaust and recharge of air, and the above is repeated.

What puzzles me is the statement that when one volume of steam is mixed with eight volumes of hot air the mixture at once rises to the boiler pressure. One could understand the rise if the communication to boiler were open; but the description states a fixed steam charge of one-eighth, and the claim is that cylinder condensation is reduced—in fact, put out of court altogether.

At the same time the power of the steam to do work is still further augmented as above.

The prevention of cylinder condensation we may freely allow. Years ago, Professor Osborne Reynolds, of Manchester, showed that a 5 per cent. admixture of air enormously reduced cylinder condensation, its action being apparently as steam condensed against the cylinder walls, to be, as it were, filtered out and deposited against the metal in a uniform film, so insulating these against steam contact, much as though a mixture of sand and small shot should be shaken in a sieve too fine to pass the shot. The sand would run through, and continue to do so until each perforation of the sieve was stopped by a pellet, when the sand would cease to run through.

An engine thus fortified would, I believe, save about 10 per cent. of fuel.

Let us make a calculation of the heat side of this new discovery, and see if we can give any serious credence to the system.

We will proceed on the basis of 1 volume of steam at a boiler pressure of say 65 pounds, and 8 volumes of air at atmospheric pressure and 400° temperature. The weight of a cubic foot of air at 32° is .080728 of a pound; of 8 cubic feet, .6458 pound.

At 400° F. its density being less in the ratio $\frac{493}{400+461}$, the 8 cubic feet will only weigh .571 of .6458, or say .37 of a pound.

Now the 1 cubic foot of steam at say 79 pounds gauge pressure (I am using Rankine's steam tables) has a temperature of 311° and weighs .1846 of a pound, or we may say just about one-half the weight of the hot air with which it is mixed.

We may now drop the volumetric term and use the weight ratio as more convenient, and assume we have a mixture of

2 pounds of air at 400°,
1 pound of steam at 311°; difference, 89°.

We now require to find their combined mean temperature.

The specific heat of air is 169 at constant volume and .238 at constant pressure, that of water being 1.

As we are not told that the air chamber varies in size, we may conclude to use the constant .169 for constant volume.

For steam the specific heat is .370 at constant volume and .480 at constant pressure.

The pressure of the steam, we are told, remains constant, so that we will use the constant .480.

But if the steam pressure remains the same the steam has expanded, and the pressure on the air is practically five-fold, so that its volume is not constant, and we cannot use .169 as the coefficient. Neither can we use the coefficient for constant pressure, so we will take the convenient compromise of .2.

We then have to divide 89° of temperature between air and steam.

Two pounds of air of .2 sp. heat we will call 1 at .4 mixed with 1 of steam at .48.

To equalize matters, the air must part with $\frac{.48}{.48+.40}$ of 89°, and the steam must gain $\frac{.40}{.48+.40}$ of 89°.

The two amounts are 48½° and 40½°, and the mean temperature will be, therefore, close on 360°.

Now saturated steam at 360° has a pressure of about 153½ pounds absolute, or say 140 pounds gauge pressure, which would lead us to suppose that our original one-eighth of steam in the mixture would now fill a fourth of the vessel, whilst the eight parts of air would, if separated from the steam, be forced into three-fourths, and would of itself have a pressure of some 20 pounds instead of 15, and, too, with but little loss of pressure due to cooling.

The hot steam by itself, if it filled the vessel, would have a pressure of $\frac{154}{8}$, or also nearly 20 pounds; but we assume it fills a fourth only, and so has .40 pounds pressure.

By themselves, however, each vapor would fill the vessel at pressures of we may now say 14 and 20 pounds, and as they are both shut in one vessel they would have a pressure of 34 pounds. This I should say is quite a favorable view of the qualities of mixed vapors.

We have therefore now half a cylinderful of vapor at 34 pounds, as against a sixteenth of a cylinder of straight steam at 79 pounds.

The straight steam cut off at a sixteenth of the stroke will give a mean pressure throughout the stroke of fully 17½ pounds by the usual hyperbolic formula:

$p = P\frac{1+H}{R}$, or $p = 79\left(\frac{1+2.560}{16}\right)$ ∴ $p =$ 17½ pounds, and we will neglect condensation.

Now the eight cubic feet of mixed vapor is not admitted to the cylinder and cut off, but simply expands to three times its volume, occupying finally the cylinder and the vessel of half capacity of cylinder. We need to slightly modify the hyperbolic formula for this case, for no power is developed in the reservoir, and we must therefore drop the 1 before the H in the formula, which becomes

$p = P\frac{H}{R-1}$. Now P is 34, and R being now 3, its hyperbolic logarithm, or H, is 1.0986, say 1.1, so that p becomes

$34 \times \frac{1.1}{3-1} = 18.7$ mean pressure when expanding, which is about 7 per cent. better than the straight steam, and we have here neglected the increase of pressure due to using a vapor at 34 pounds, which has a temperature of 360°, or 100° above saturation temperature.

Let us suppose this adds, as it apparently should add, about 14 per cent. to its pressure. Then the above 18.7 should be 21.3 pounds—an advance in mean pressure of nearly 22 per cent. above straight steam. Rankine's investigation of steam when superheated showed 23 per cent. saving where the superheat was taken, as in the new system, from the waste heat of the furnace.

Unless I have made some slip in my figures my elementary calculation shows that, unless the new system really does subvert accepted thermal laws, there is nothing like 60 per cent. of saving possible, nor does the saving of 60 per cent. in the manner indicated present itself as a likely thing to occur. For high-pressure engines the system may be excellent as a means of superheating, but what of condensing engines, which

form the bulk of all large engines? They will all want new air-pumps.

The tendency of the steam engineer is to discount all 50 per cent. savings. The last I met with never got beyond the syndicate who saved fully 50 per cent. of the capital subscribed by the public. The present idea has a sound basis of reason, however, and it is very easy to understand how a small quantity of perhaps wet steam could be admitted into a (perhaps thick) iron vessel, through which hot air at 400° has been drawn perhaps in considerable volume, and for the result to be as stated; but in such case the heat has been given up by a lot of air blown through, and been stored in the iron and again given out to the wet steam.

There might be arranged for a good deal of economy by some such utilization of furnace waste heat to dry thoroughly wet steam in a special vessel from which the engine should draw its steam hot and dry as possible, especially now that mineral oils offer better facilities for high temperature working, but not 60 per cent. by mere air mixture. The hot air reservoirs are left full at one third the initial pressure, and all this is, of course, lost. W. H. BOOTH.

About Steel.

Editor American Machinist:

I wish to give the writer of the letter on "An Interesting Experiment with Steel," in your issue of November 12, a word of friendly advice, which is, firstly, that before experimenting further, or forming any more theories, he acquaint himself with the existing literature on steel, and see what has been done already. When he has ransacked every available piece of literature on the point he is interested in, he will be ready to begin new investigations—not till then. In almost any well-equipped library he will find Henry Marion Howe's recent book on "The Metallurgy of Steel," and that he would find a most entertaining and profitable beginning, as well as a very exhaustive and accurate guide. If he will keep the references looked up as he goes along, this one book will leave him pretty well informed on the state of knowledge on steel structure and composition.

Secondly, will Mr. Wetterer excuse me if I make some equally friendly suggestions as to his future methods of work? I do not think he is wise in going in on the chemical line; he is evidently not a chemist, and, that being the case, he will be constantly in danger of being led to false conclusions by appearances which have quite another explanation. At least, if the chemical side of the question is of great interest to him, I would advise a course of study of two or three years' duration at least—sufficient to familiarize him with the every-day routine of chemistry.

I think, however, that advance in knowledge relative to steel structure is not to be looked for in the line of chemistry. The microscope—a very ordinary one will do to begin with—will give more and better information in a given time. If he will examine fractures of different samples of steel hardened at different heats, annealed in various ways, "hammer-tempered" burnt, overheated, oversoaked, etc., etc., and give us his results, with accurate drawings or photographs, I for one should be interested in them, and should expect that he would find it profitable and instructive.

Perhaps nothing very new might develop, but no one develops anything new in science in these days without years of slow and painstaking work.

Finally, to show that I have not been setting up a man of straw, let me call Mr. Wetterer's attention to his letter of November 12. Mr. Goodyear has already noticed some of the leading points.

First, as to that "melting" of carbon. If I should undertake to straighten out that first paragraph, it would take more space than the AMERICAN MACHINIST could spare; all I will say is that Mr. Wetterer is in error on almost every point, and that the "prominent work on chemistry," which I recognize by the quoted words, had better find a resting place in the nearest ash barrel.

The same remarks apply to the second paragraph. It is not specified what "acids" were used; but, whatever the acid, no such thing could by any possibility take place as he declares confidently and without qualification do take place. What does Mr. Wetterer understand by "nascent carbon," anyway? It is a term that has no place in his scientific vocabulary for some time. I advise him to let it, together with atoms and all associated things, go. They are profitable to the chemist alone. In order that Mr. Wetterer may not think I have meddled in something which is not my affair, I will say that I have been a chemist for about ten years now, and much of my work has been in connection with steel and iron.

I most heartily wish him success as an investigator, but time is too precious to waste in such work as he describes.

JOSEPH TORREY.

Printing Press Cylinders.

Editor American Machinist:

After reading your correspondent's letter, in your issue of Nov. 26, on the above subject, I confess it puzzles me to know what position to take now. He first comes out as the Critic in your issue of Oct. 8, and endeavors to pull down my house and rear his own on the ruins.

I defended myself, or tried to, in your Oct. 29 issue, after which, to my surprise, Critic appears as the criticised, and charges me with wandering from the point of argument, viz., the comparative cost of *pattern making* in the two methods.

I would remind him that, in my first article on printing press cylinders, Sept. 17, which he criticises, nothing was mentioned about cost of pattern, the chief object in mind being to show how to build a pattern that should reduce the cost of producing the greatest number of castings to the lowest possible figure, and this is what the style of pattern I represented will do.

When the question was raised about the relative cost of patterns, it was entirely out of order and disingenuous on your correspondent's part, and because he raised that point it was scarcely fair for him to expect me to consider that alone, at the expense of the more important ones, which were previously taken into account.

A number of questions about the relative cost of the two patterns is put to me, and I am asked to acknowledge that your correspondent's pattern is the cheaper; this I have already done, in your issue of Oct. 29, and any ordinary reader must have seen it; I will do so again, for his pattern is the *cheaper* of the two. But what does that signify? Simply nothing, except that cheap tools for doing a standard class of work are generally the most expensive in the end, and this cheap tool or pattern is no exception.

I have no doubt that something could be made that a molder might make a printing press cylinder from, which would not cost one-quarter as much as this so-called cheap pattern, but then how absurd it would be for any one to attach any importance to that fact.

Your correspondent wishes me to confine myself to this one point (that he raised himself), and to disassociate the *use* a pattern is subjected to from the *cost* of it. This I cannot do, for it is necessary to look at the inside as well as the outside of a house before taking it. He must, therefore, accord me the privilege of looking at all sides of the question, the same as I invited him to do in my letter of Oct. 29, and which I am glad to find he has done in your issue of Nov. 26.

I will try to answer some of the questions that have not already been answered. First. "What would I do to make a longer core from my core box?" Well, if the box was not long enough for any ordinary press cylinder, I would do the same as most folks do when a thing is too short—make it longer. Bnt these core boxes are usually made long enough for any probable length of press cylinder, so that any probable length core of the same diameter can be made from one box.

Why did I discard, many years ago, the plan of making these cylinders as shown in your Oct. 8 issue? Because, after much consultation with the foundry foreman and others, which constitute a kind of "Ways and Means" committee with us, it was decided to try some other way, which resulted in the method shown in the AMERICAN MACHINIST, Sept. 17 (not Nov. 27).

I have referred to this method as my plan, being the most convenient way of expressing my views, but your readers will understand that it is not the intention to interpret "my plan" literally—I think this is understood.

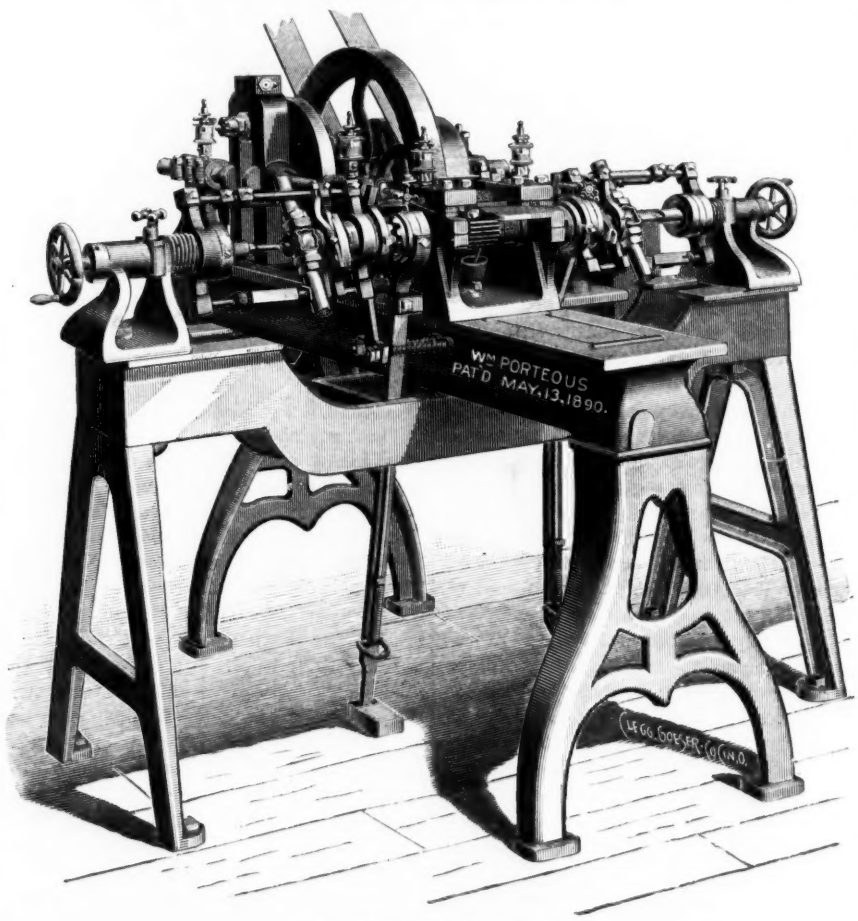
I hope the foregoing will satisfy my Critic as to my reasons for discarding his plan years ago.

In the two last paragraphs of your correspondent's letter he fairly shines in the foundry department, his conception of what constitutes large foundry work is great, and his announcement that "large bodies move slowly" is startling.

The statement that I would find it would take "first-class or best paid molders" to make suitable cores from my core box, shows that the author of that statement knows very little of the subject he writes about. Does he suppose that I have set forth some pet theory of my own to be experimented on? If so, he is mistaken; for the plan I represented is the one that very many firms adopt who make it a business to cast printing press cylinders.

In the last paragraph of your correspondent's letter, Nov. 26, he resorts to misrepresentation. He says: "There are more chances of the metal running out between two flasks about six feet long, clamped together with two clamps on each side (as they usually are), than for the metal to run out between two flasks about two feet square, as shown in plan B" (his plan). The writer knew when he wrote the above that more than "two flasks two feet square" are used when making a press cylinder by his plan, and in his own illustration he shows four flasks with no cope. This way of representing is, to say the least, unfair and misleading. I do not wish to quibble about terms, but Mr. Brand has, on this point, erred, and I hope he will see the error of his ways, repent and be forgiven.

P. S. DINGEY.



COCK-GRINDING MACHINE.

A Good Use for Aluminum.

Editor American Machinist:

We have found a good use for aluminum in the shape of a very neat working model of our grinding machine, which is made on the scale of one inch to the foot; the original machine weighs 24 tons; the model and block to which it is attached weighs 14½ pounds, and makes a very pretty model.

Allegheny, Pa. THOS. CARLIN'S SONS.

Cock-grinding Machine.

The accompanying illustration is of a machine which is being used for grinding plug cocks at the Wm. Powell Brass Works, Cincinnati, having been invented by the superintendent of the shops, Mr. Wm. Porteous.

At the back of the machine there is a shaft on which is placed the driving pulleys and a fly wheel, one end of this shaft being provided with a crank disk, the crank-pin engaging with a yoke by which a reciprocating motion is given to rods which are held in bearings secured to the bed of the machine.

This reciprocating motion is thus imparted to a rack, which, by engagement with a pinion, which is on the grinding spindles, gives them an oscillating motion exactly analogous to that given by hand when doing such grinding.

The frequent release of the plug from the valve and its insertion in a new position, which, as every mechanic knows, is necessary to the success of the operation, is effected by means of the interlocking clutch seen on the spindle, which at frequent intervals is automatically released and thrown in, in a new position. A spiral spring, the tension of which can be regulated to suit work of any size, forces the plug into place while the grinding is being done. Sand and water or oil are used for the grinding, the same as by hand.

The machine is shown with two heads, but as many as may be desired can be added, all driven from the same reciprocating motion.

It is found that one man can easily control the working of two or three heads, and the work done is superior to that usually obtained by hand work.

It is probable that an assistant to the Inspector of Weights and Measures will be appointed in Jersey City, his duty being to see that people buying coal get honest weight. This will make work for carpenters in the way of increasing the size of coal bins. A bin that will hold two tons of 1,600 pounds will be found too small for two tons of 2,000 pounds.

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☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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CONTENTS.

	PAGE
Sixty-three-Inch Lathe	1
The Hand Wheel Lunacy. By William H. Harrison	1, 2
A New Independent Reversible Jaw Chuck	2
Railroad Progress in Japan	2
A New Quick-firing Gun	2
Condition and Prospect of the Machinery Business	3, 4, 5
A New Grindstone Frame and Truing Device	5, 6
Letters from Practical Men: A New Steam Engine. By W. H. Booth....About Steel. By Joseph Torrey....Printing Press Cylinders. By P. S. Dingey .. A Good Use for Aluminum. By Thos. Carlin's Sons	6, 7
Cock-grinding Machine	7
Copying Machine Designs	8
Two Safeguards	8
Literary Notes	8
Questions and Answers	8, 9
The Future Speed of Steamships. By Observer.	9, 10
Says it is Stuff—Points Obtained from a Machine Shop in Hartford—The Surprising. By Jarno	10
University Extensions. By D. D. Donnovan	10
A Big Coal Scheme	10
Manufactures	11
Machinists' Supplies and Iron	11

Copying Machine Designs.

The practice of copying machine designs is one that always interests machinery men in one way or another, and the question presents many phases, whether looked at from the standpoint of the one whose designs are systematically and regularly appropriated, or from the standpoint of him who is always looking out for an opportunity to see what can be appropriated without running counter to the laws enacted to protect patent rights.

Coleman Sellers, in the second installment of his article on "American Supremacy in Applied Mechanics," published in the *Engineering Magazine*, gives an interesting illustration of the fact that the only safe course for the copyist to pursue is to copy precisely; for, if he attempts to vary in any particular from the original design, he is liable to miss the controlling idea and make a machine which is ridiculous. Mr. Sellers says: "An American machine-tool builder visiting an English workshop was shown, as a copy of an American planer, one adapted to planing the stub ends of connecting rods for locomotives, there being two sets of uprights and two crossheads and four tool holders adjustable in position for enabling both ends of two connecting rods to be planed simultaneously. The American tool from which the idea was taken has its crossheads facing one another, and the platen is speeded to run back and forth at the same rate of cut. By this means the machine is made to take a cut at each forward and backward movement of the table. The English machine had its tool holders facing all one way, and all four cuts were taken at one and the same time, only when the table was running forward, no work being done at the back stroke. The power of the American machine was, therefore, double that of its English copy, all other things being equal, and the designer of the copy was astonished when this was pointed out to him."

Prof. Sweet touched upon the same subject in our columns last week, taking the position that it may require even more ability to change a design slightly, and not spoil it, than to design it originally. There were other points probably thought of by the designer of the American planer referred to, which are not mentioned by Mr. Sellers, and probably escaped the notice of the copyist, among these being a better distribution of wear than is the case where the cutting is done in one direction only, and the tool heads facing one another could all be under the eye of the operator practically at the same time, and be much more easily reached than where one housing would have to be walked around in order to reach the tools supported by it.

We do not think the copyist missed the idea in this case because he was not an American machine tool builder, but because he was a copyist, and not an originator. A man who designs an entirely new machine carefully considers every detail, not only by itself, but with reference to all the other details and to the central or main idea of the machine, while he who afterwards changes the design in any way is apt to do it without considering more than one point, and that covered by the change he proposes to make.

The gist of the whole matter is found in the fact that the work done by an inferior and unintelligent workman is inferior work, while that done by a superior workman is superior work. A first-class design, if exactly reproduced, is still a first-class design—the product of a first class man. Any change whatever made in this design by an inferior man will inevitably be inferior to the rest of the design, simply because that portion of the design will be the product of an inferior man.

Two Safeguards.

The recent more than usual accidents on railroads and in manufactories—boiler explosions and the like—go to show the propriety of using the ordinary mechanical means for preventing such accidents, and as well to the close observations of experienced and skillful operatives. On railroads, for example, there should be not only a rigid block system, but the best men should be employed to supplement that system. In this case it would not be probable that human intelligence and mechanical appliances would fail at the same time.

And about the boilers of a manufactory, they should be fitted with all the modern appliances that go to provide for safety, but as well should be under the eyes of strictly competent men.

There is everything to be said in favor of safety appliances in all branches of steam engineering—everything is to be said in their favor and nothing against them—but it is when there is an assumption that these appliances can take the place of skill that the mistake is made. These appliances should be considered simply as helps to the skilled engineer; they should be looked at as something to help him in the way of warding off accidents and in bringing about economy of operation.

About a steam plant the safety valves may work just about to the limit of perfection for ninety days, and on the next day may go wrong; and so with other appliances. The skilled engineer has his eyes and ears to depend upon, and while there is no finely divided scale to depend upon, he locates the difficulty and judges pretty closely as to its extent and location.

We believe, as before indicated, in the use of every actual safety or economical appliance, but we believe, even more, in the employment of the very best men to be had. In this country we trifle too much with the use of steam, whether it is employed on railroads or in manufactories.

Literary Notes.

THE COMMON ROADS OF EUROPE AND AMERICA. By Isaac B. Potter. HIGHWAYS AND NATIONAL PROSPERITY. By Edward P. North, C.E. THE IMPORTANCE OF GOOD ROADWAYS. By Prof. Lewis M. Haupt, A. M., C. E.

The machinist is, of course, directly interested in any effort to do by the aid of machinery what has formerly been done without it, or remained undone; he is consequently interested in bicycling, whether he himself indulges in the pleasure of it or not. The bicycle industry has grown to be one of great importance, and bids fair to become much more so with the development which it bids fair to have. But it has been found that the most serious obstacle in the way of the general employment of the wheel is bad roads, and when the subject is still further looked into it is found that bad roads are a serious obstacle to the enjoyment of a great many other desirable things besides wheeling. And it can be, and in fact has been proven that bad roads are far more expensive, when all their results are considered, than good roads are, and that, in fact, there is scarcely a better investment that can be made by any community than that called for by the best roads, kept in the best of condition. A man on a bicycle immediately begins to find out things about roads which he never suspected the existence of before, and he becomes intensely interested in good roads. This fact has led the League of American Wheelmen—a powerful organization now comprising a membership of about 25,000—to take up the subject of the agitation for good roads, and a committee has been appointed, with Mr. Isaac B. Potter, Potter Building, New York City, at its head, whose special business it is to do what may be possible to educate public sentiment on the subject of good roads.

The pamphlet comprising the three papers whose titles are given above is the first publication by this committee, and constitutes a most convincing argument. It is illustrated from photographs taken in this and foreign countries, and abounds in facts and figures to show that no community can afford to be cursed with such things—by courtesy called roads—as are to be found in many sections of this country. As indicated by the titles, the subject is treated from various standpoints, and in a very interesting way. If it can be shown that we can have really good roads for less cost than we now have the poorest roads, it is important that every citizen should be presented with the evidence, and it is to be found within this book. It may be obtained by addressing Mr. Potter, as above.

Locomotive Engineering.—This is the first appearance of the *Locomotive Engineer* under its new name as above, and we think few railroad men will fail to find in its columns something to interest them. It is a railway employes' paper, but the employes who are interested in it extend through all branches of the service, from the enginemen to the highest officials, there being articles in this first number from men in nearly all positions on railroads. The contents are bright and varied enough to suit all tastes, as would be expected from its editors, of whom Mr. Angus Sinclair was formerly associate editor of this paper, and Mr. John A. Hill a contributor to its columns. They both understand railroading thoroughly, are enterprising and progressive, and evidently determined to make the best possible paper for practical railroad men. It is published monthly, at 912 Temple court, New York.

The December number of the *Machinery Molders' Journal* contains as a frontispiece a very good likeness of our contributor on foundry matters, Simpson Bolland, accompanying which is a short sketch of his life, or at least that part of it which is completed, Mr. Bolland being still very much alive, of course. We understand that the Wileys will soon bring out a book upon foundry practice by him, which will be composed mainly of material which has appeared in our columns.

An engineer on the Missouri Pacific recently got ahead of train robbers. The robbers disposed of their forces so as to bring the train to a halt, but the engineer "pulled her open" and forced his train through the human obstruction, amidst a few shots, resulting only in the useless expenditure of powder.

Questions and Answers.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(9) X. Y. Z., Elizabeth, N. J., writes: Please advise me where I could find reading matter relating to the laying out of a screw propeller. *A.*—See Steam Engine Design, by J. M. Whitham.

(10) A. T. C., Chicago, Ill., writes: Can you give me the address of the publishers of J. H. Cromwell's system of easy lettering? *A.*—E. & F. N. Spon, 12 Cortlandt street, New York. 2. Can you recommend an easy book treating on the slide rule? *A.*—Write to W. Cox, 127 Fulton street, New York.

(11) A. K., N. Y., asks: What different materials, besides oil, are used in bringing the bearing of a new engine to a good fit while running slowly at the start? *A.*—Graphite is often used dry; sometimes it is mixed with the oil supplied to the bearings; sulphur is also used for the same purpose. But generally the journals in engines of good workmanship will run cool without any other lubricant than lard oil; if, in these, heating does occur, the cause should be located and removed.

(12) W. G., ——, N. Y., writes: Please advise me what books I can get on gearing which will give me instructions in laying out spur, bevel, and worm gears correctly. *A.*—The series of articles treating on Odontics, or the theory and practice of the teeth of gears, completed in our issue of December 25, 1890, will give you the information you seek. These articles are also published in book form, and can be had of Geo. B. Grant, Lexington, Mass. Practical Treatise on Gearing, by the Brown & Sharpe Manufacturing Company, Providence, R. I., is another excellent book.

(13) E. N. F., South Hanson, Mass., writes: I have a steam launch 24 feet in length, 5 feet beam, and draws 28 inches of

water aft and 8 inches forward. She is driven by a 3x4 inch engine; boiler is of the tubular type; steam pressure, 100 pounds per square inch; vacuum from 24 to 26 inches. The propeller is 18 inches diameter; pitch, 30 inches; three blades; number of revolutions, 340 per minute. Under these conditions I can only get a speed of six miles an hour. Do you think the propeller is too small? *A.*—We believe the propeller to be well proportioned for the size of engine; and with a sufficient steaming capacity of the boilers you should be able to run the engines up to a speed of 400 revolutions per minute. For higher speeds of the boat you will need a larger engine and boiler, which will also enable you to employ a larger propeller.

(14) A. P., Quebec, Canada, writes: I would like to know the best and cheapest way of transmitting power (10 H.P.), through a long distance. I have used manila rope, but it will last for two months only. Is chain good for that purpose? *A.*—We should not use chains for the transmission of rotation between distant shafts; wire rope is better adapted for that purpose. Wire ropes, in consequence of their greater strength, are smaller than hempen ropes for the same load, but, having less flexibility, they require larger pulleys. This fact must not be overlooked in contemplating the use of a wire rope in place of a manila rope. 2. Are there any hooks made for uniting the ends of a 1-inch manila rope without splicing? *A.*—We do not know of any.

(15) J. D., Bluefield, W. Va., writes: I have designed a very simple and strong pipe wrench. It will hold from $\frac{1}{8}$ of an inch to as large a pipe as you wish. It is very easily made, the number of parts being few. It will do the same work as other pipe wrenches that cost $6; my wrench can be made for $2. I cannot see my way clear to file an application for a patent. What would you advise me to do to get my pipe wrench on the market, so that I could make a few dollars for my trouble? I acknowledge my letter is a little blind, as I should not be doing myself justice to forward sketch of wrench. *A.*—We should advise you to engage a reliable patent solicitor, and obtain a patent for your invention, so that you can show it and interest other parties in its manufacture. If it is as valuable as you say it is, you will have no trouble to find parties willing to manufacture it and place it on the market for you, allowing you a royalty.

(16) J. S., Stillwater, Minn., writes: I am running a 24x30-inch link motion piston valve engine. I want to change it to one eccentric. The dimensions of valve and ports are: Valve, 12 inches diameter; ports, $1\frac{1}{4}$ inch wide; outside lap, $\frac{7}{8}$ inch; inside lap, $\frac{5}{16}$ inch; travel of valve, $4\frac{1}{2}$ inches. Please inform me what throw the eccentric must have to cut off at $\frac{3}{4}$ stroke of the piston. This engine drives a saw-mill, and by doing away with the link motion I think that I can get better results. *A.*—The point of cut-off is not regulated by the throw of the eccentric; it is regulated by the amount of lap. To cut off at $\frac{3}{4}$ of the stroke you will need $1\frac{3}{8}$-inch lap with the present travel of the valve. This will give you a port opening $\frac{7}{8}$ inch wide for the admission of steam. Whether this will answer your purpose we cannot say without knowing more of your engine, and the work she has to do. If you need a greater port opening you will require a greater travel of valve, and also an increased amount of lap.

(17) B. F. W., Bridgeton, N. J., writes: I am a machinist with eight years' practice at the business, but would like to become a marine engineer. Would you please tell me through your columns how I should proceed to gain that end and what books to study? *A.*—We should advise you to seek employment as a machinist in a shop where marine engines are built, and show by your conduct and faithful attention to business that you are worthy of confidence, and that you have the ability for becoming an engineer. In these shops you will come in contact with chief engineers of steamers to whom you may state your desire, and, if you are worthy of it, your employer will undoubtedly interest himself in your welfare, and aid you in gaining your ends. Another way would be to apply to chief engineers on steamers at once for a position as assistant, but we believe the first way is the best; we have seen several young men follow it, who were rapidly promoted. In the meantime, devote your leisure hours to study; the course to be pursued has been indicated in our issue of February 19, 1891.

(18) A. T., Altoona, Pa., writes: Is there a book published that will give me instructions in building locomotives, and the name of each piece, and what it is for? I have Mr. Forney's Catechism of the Locomotive, but I would like to know if there are any other books treating on this subject. *A.*—The articles on Modern Locomotive Construction, by J. G. A. Meyer, which have recently appeared in our columns, are now in the hands of the publishers, John Wiley & Sons, and these, with much additional matter, will soon appear in book form. Although this book will not be quite as elementary in character as you call for, it is the author's aim to give full instruction in the construction of all parts of the locomotive.

(19) J. W. H., El Paso, Texas, writes: I am running a 100 horse-power upright engine with a Meyers' cut off. I have to run with the cut-off wide open all the time, so as to get more exhaust steam into the condenser; and, besides this, I have to turn live steam into the condenser, to get more water. We make ice from the condensed water, but we do not get enough through the cylinder. What I want to know is this: Would it be advisable to take out the cut-off valve and run with the main valve? *A.*—We do not have sufficient data relating to your plant to advise you correctly. In small plants, where the economy is limited to the production of distilled water actually required to make the ice—exhaust steam being used for this purpose—the simplest form of engine, often without a cut-off valve, is used; but there are cases where a cut-off is useful, so that the maximum economy can be adjusted; and when the exhaust steam does not give the required amount of water, the deficiency has to be made up of fresh water, which is either boiled, distilled, or drawn direct from the boiler, undergoing a purifying and cleansing process before it is used in the cans. We should advise you not to remove the cut off valve until you have consulted the builder of the plant.

(20) J. B. L., Hartford, Conn., writes: Please give me a correct rule for computing the pressure per square inch required to burst a cylinder made of material whose tensile strength per square inch is known. To illustrate: What pressure per square inch will be required to burst a cast iron cylinder 10 inches inside diameter; metal 1 inch thick; tensile strength 20,000 pounds per square inch? *A.*—Let S denote the tensile strength per square inch of the metal; t the thickness in inches; r the inner radius of the cylinder; p the pressure per square inch. Now the force which tends to rupture one side of the cylinder is equal to the product of the radius into the pressure per square inch, or $r \times p$. The resistance to rupture is equal to the product of tensile strength per square inch into the thickness, or $S \times t$. Hence, just before rupture $p \times r = S \times t$.

From which we get

$$p = \frac{S \times t}{r}$$

Substituting for the symbols their values, we have

$$p \frac{20{,}000 \times 1}{5} = 4{,}000 \text{ pounds.}$$

This formula is applicable when the thickness of the metal in comparison to the diameter is small. When the thickness is comparatively great, the formula given in answer to Question 475, in our issue of October 29, 1891, is often used; according to that formula the bursting pressure will be 3333 pounds per square inch.

(21) J. R., Huntington, W. Va., asks: How much water per minute will pass through a three-quarter-inch gas pipe 20 feet long, which is connected to a main pipe in which the pressure is ten pounds per square inch? Please give rule. *A.*—The first step will be to find the velocity of the water in the pipe. This can be computed by the following formula:

$$v = \sqrt{\frac{64.4\,h}{1.5 + f\frac{l}{d}}}$$

in which v denotes the velocity per second; h the head in feet; l the length of pipe in feet; d the diameter of the pipe in feet, and f denotes a friction factor which varies with the roughness of the interior surface of the pipe, with the diameter, and velocity of flow; in this case we shall adopt .03 for the value of f. The head h is found by multiplying the pressure by 2.304; hence the value of $h = 10 \times 2.304 = 23$ feet. Substituting for the symbols their values, we have

$$v = \sqrt{\frac{64.4 \times 23}{1.5 + .03 \times \frac{20}{.0625}}} = 11.5 \text{ feet}$$

per second. The discharge per second is found by multiplying the velocity by the area of the pipe; the latter is equal to .003 of a square foot. Hence for the discharge we have $11.5 \times .003 = .0345$ of a cubic foot per second; or $.0345 \times 60 = 2.07$ cubic feet per minute. This method of finding the discharge applies to comparatively short pipes. For long pipes the formula given in answer to Question 550, in our issue of December 24, 1891, is used.

(22) J. M., East Farnham, Canada, writes: I am a blacksmith, and have some ideas of a machinist's work. I have charge of a machine shop and foundry. On account of the increase of our business we have to put in new tools. Have you a paper or a book that will assist me in finding the correct speeds of all kinds of machinery, and computing the speeds of shafting? *A.*—Write to the manufacturers of the tools, for catalogues; these generally give the speed for each machine, and also the speeds for the countershafts. For computing the speed of the shafts, it is only necessary to remember that the speed of one shaft (to which we may give, for the sake of distinction, the name "countershaft"), multiplied by the diameter of its pulley, is numerically equal to the speed of the other shaft (which we may name "main shaft"), multiplied by the diameter of its pulley. It is always more convenient to express these conditions in symbols. Thus: Let s denote the number of revolutions per minute of the counter shaft; d the diameter of its pulley in inches; S the number of revolutions of the main shaft, and D the diameter of its pulley in inches.

We then have:

$$s \times d = S \times D.$$

From which we get the following formulas:

$$s = \frac{S \times D}{d}$$

$$d = \frac{S \times D}{s}$$

$$S = \frac{s \times d}{D}$$

$$D = \frac{s \times d}{S}$$

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

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"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

The Future Speed of Steamships.

BY OBSERVER.

The question, "Has the limit of steamship speed been reached?" is frequently discussed by engineers and ship owners.

Apparently there is little to expect in the way of improvement in the lines of the hulls of the fast sea-going steamers. As for the material used in construction, there can be but little reduction in weight until we produce a new metal to meet this requirement.

The stiffening of the lower portion of the hulls near the keel was a great stride toward the realization of 20 knots per hour, for it enabled the marine engine designer to raise the speed of his 60" stroke engine from 60 to 82 revolutions per minute, without incurring the risk of excessive top vibration and the resultant breakage.

Some of the early iron coast steamers built in New York, Philadelphia and Wilmington, were fitted with engines having piston strokes from 36" to 54", and they were rarely speeded above 50 revolutions per minute. It was simply impossible to go beyond the speed without subjecting the whole structure to uncomfortable vibrations.

True, there was very little attention paid to balance the revolving and reciprocating parts of engines in those days, but I doubt if even fair balancing had been practiced we could have attained a speed of 65 revolutions with a piston stroke of 54".

After the era of bottom strengthening had come, the engine designer presented the triple-crank engines, and this simple addition of one crank helped to raise the speed at least 12 per cent.

The thrash of the connecting rods of high-speed engines is always a source of vibration, especially in vertical engines, but we have not as yet been able to dispense with the connecting rod.

It would be entirely out of place for the writer to describe the various forms of the double, triple and quadruple marine engines, and he will therefore simply say that the very highest art in engineering has lately been displayed in producing engines for sea-going ships by builders in various countries.

We are now waiting to see how the new *triple-screw* ships will perform, and expect that they will show many advantages. The diameter of the screw and stroke of engine can be reduced a little, while the pitch of the screws can remain about the same as that used with two screws.

The probabilities are that a stroke of 54" can be adopted in place of 60", with a shaft speed of at least 94 revolutions per minute, and possibly 100 revolutions per minute.

The connecting rods of a 54" stroke engine will be but 11 feet long between centers, and taking into account the reduction in crank-pins when adopting three sets of engines instead of two, these connecting rods can be materially reduced in weight, and thus reduce one of the great disturbing forces.

The designer may lighten these rods, still using the materials now generally used in their construction, but there is a possibility that we shall find a lighter metal for this purpose, if the chemist keeps abreast of the times. A metal having the qualities of good open hearth low carbon steel, say 12, with the tensile strength *raised* by some alloy to about 90,000 pounds per square inch, would be worth 25 cents per pound in the rough billet to marine engine builders. Such a metal would reduce the weight of the heavy parts in motion 35 per cent., and this would mean 110 revolutions for a 54" stroke engine. We now have good anti-friction metals, but these can be improved by increasing their cost, so that the pressure per square inch can be largely increased, and the lubricants offered for heavy pressure and high speed are also rapidly improving in quality. It has required the constant study for the past twenty years of many engineers to gain five knots per hour, and it has been stated in print lately that it will probably be ten years before another

five knots is added. This may be an accurate prediction, but the probabilities are that at least two knots will be gained within the next two years.

Several magazine articles on this subject have intimated that the chief obstacle in the way of increased speed was a lack of good boiler design suited to high pressure. The usual pressure for triple-expansion engines (three cylinders) is 160 pounds, though some ships carry 170 pounds per square inch. Of course the fourth cylinder can be added, and still use but three cranks, and some European yacht engines are constructed on this plan. With four cylinders arranged for a complete quadruple expansion engine, a pressure of 185 pounds would be best, and this pressure could be maintained on boilers a little smaller in diameter than those now used, adding, say, one boiler, to compensate for the reduction in diameter.

Petroleum will, no doubt, be used on freight-carrying ships. The writer has burned 2,000 gallons of Lima oil daily for the past three years under six land boilers. The average evaporation for a twenty-six days' test was 16.22 pounds of water, with one pound of Lima oil. The oil costs $2\frac{4}{10}$ cents per gallon, and a gallon weighs seven pounds.

The boilers are return tubular, with common brick settings. There is no *odor*, and no *smoke*. Ordinary egg anthracite coal would have to be $3.70 per ton to compete with the oil in *this* case, as there are no ashes to handle and move when using the hydrocarbon.

If crude petroleum ever comes into general use for ship fuel, boilers can be made to hold safely a pressure of 200 pounds, as the whole furnace system can be changed.

The lubricants for the high-pressure cylinder will require some watching under a temperature corresponding to 200 pounds pressure per square inch.

Says it is Stuff—Points Obtained from a Machine Shop in Hartford—The Surprising.

BY JARNO.

Since the publication of my article, Nov. 26th, I have received a letter which says, "The statement that metallic surfaces can be given an increased resistance to wear and to a cutting tool by rubbing them with emery is all stuff and nonsense." I immediately answered, requesting my correspondent to put his opinions in print. He replies that he cannot write for the papers, and asks, "If you can rub emery into metal, why are not spindles and boxes ruined by grinding them with an emery wheel? Why not rub emery into the steel gauges as well as into that cast-iron gauge bushing of yours?"

The hardest stones are cut with a sheet-iron disk, or slicer, into which diamond dust has been rubbed. I have seen diamond dust rolled into a soft steel lap with a hard steel roll; the lap forms and sharpens watch gear cutters. Now, when a slicer or a lap is worn dull or smooth so that it will not cut, it may still hold enough of the powder to resist wear. In proportion to its hardness, emery behaves like diamond dust, though I should not expect to improve the wearing quality of a steel spindle and box by charging them with emery, because I should fear that grains would get loose and increase rather than diminish wear. I should expect to be able to force only a little emery into soft steel, and not any into hard steel. The action of grains of emery cemented into a rapidly rotating wheel is very different from loose grains pressed against soft metal with hard steel. The wheel grains cut, the loose grains are imbedded. The emery imbedded into the cast-iron bushing by the lap does no special harm and adds to the lifetime of the gauge.

I again quote from my Hartford friend's letter. In the last paper I did not copy all that he had written about templates, but now, upon another reading, I copy farther on this subject:

"It is but fair to say that while we can, in trying templates together, have inaccuracies exaggerated, we also can have them appear less than they are. This will be understood by Fig. 8, in which the template *A* is, on the edge *F B* at the end *B*, an eighth inch outside the correct line *E*. This makes the edge *F B* not enough curved. The edge *C* is correct, and to it let us fit the template *D*. Now if we try *D* upon the side *F B*, as shown by the dotted lines, we shall find that the space between the templates, at the middle *M*, is only a sixteenth inch, though the end *B* is an eighth inch inaccurate. The principle is that of a lever of the second class. The fulcrum being at *F*, the movement at *M* is only half that at *B*.

"From all this, it should appear that to try two templates together, and to look at the spaces between, may be a misleading way of testing. So in making straight-edges. If each of three edges fits both the others, so as to shut out light, all three are straight; but when light is not shut out, the amount of inaccuracy becomes an uncertain quantity. In Fig. 8, a template fitted to *A* at the incorrect edge *F B* is not a good tool to test the edge *C*. The reason that I write so fully on this subject is that it has been the cause of several misunderstandings in our shop. We have with us a cousin to your Waubug Mephit. He has developed a habit of declaring that every strip of light is a sixty-fourth inch wide. He hallows all his opinions when they concern defects, and

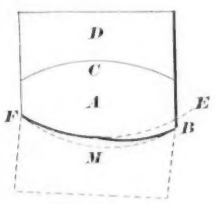

Fig. 8.

Fig. 9.

yells them when an owner is in the office. I hope that what I have written will prove an opiate. A thing that is good evidence is not always proof.

"By the way, Jarno, have you often had pieces of steel hardened while being ground? I send you such a piece. It was only a few weeks ago that I learned that steel can be thus hardened. I suppose that this is one of the things that Prof. Sweet would place in the class included by his term, 'the unexpected that often occurs.' I should not take issue with the Professor in the use of his term, but I would perhaps go far enough to apply the term, 'the surprising.'

"I ground off the fins at the ends of a lot of steel drop forgings, on an emery wheel running in water. Some ends were then so hard that they could not be turned with an ordinary steel tool. I was puzzled. Each of the hard ones was blued as if it had been heated, and I was forced to conclude that they had been hardened by first being heated by friction while pressing heavily upon the wheel, and then being cooled by the water on the wheel and also by the bodies of the pieces which conducted heat away from the ends while pressing lightly. Not all the pieces were hard, but the soft ones were in so hard company that they were under suspicion, and all were again annealed.

"The surfaces, also, of steel pieces such as saw blades and engravers' plates may be hardened in spots, or strips, during the operation of wet grinding. In pieces that are afterward to be cut or stamped these hard places occasion loss. Sometimes the poor steel maker is blamed for hard streaks, when they are not from any fault of his. Waubug's cousin puts everybody else on trial before he puts himself. Whenever there are indications of excessive pressure and of heat, when dust flies from the stone and sparks fly from the steel, in wet grinding, hard places are likely to come. Water seems to favor this kind of hardening, as it appears to have more effect in cooling hot places as they leave the wheel than in preventing their getting hot.

"Hardening may also occur in dry grinding in a variety of ways. One way is in grinding a short, thin part, that projects from a larger part, as at *G*, Fig. 9, a sixteenth thick, projecting from the body *H* a half inch thick. The body *H* quickly takes away the heat put in by the wheel. Another way is in grinding thin pieces, say a thirty-second inch thick, resting upon an iron table; these may be hardened at their edges, the heat being taken by the table. The piece that I send you was cut from a strip six inches long, the knife edge of which is so hard that it cannot be touched with a file.

"The sides of soft flat steel springs have been hardened in spots, by grinding on an emery wheel. A curious fact about these springs was that the hard spots were, in the regular process of hardening, changed to soft ones; the steel had been injured beyond recovery, and the springs were good for nothing.

"Every machinist knows of hardening by the rub of a dull tool, like the teeth of a cutter whose edges have gone. Closely allied to this is the roughing between two pieces of soft steel; the roughed places are hard.

"Whether caused by heat and cold, or by mechanical disturbance of the particles of steel, the phenomenon of hardening is mysterious in these cases, as in all others. We cannot prevent it by the use of more water, but must not speed up too high, nor bear on too heavily."

Some of my Hartford friend's letter may sound as if he were romancing; if, however, my correspondent at the beginning of this article should take any exception to his statements, I have no doubt they can be proved. I have never known any untrue stories to be told in Hartford, and so I believe this one to be true.

University Extension.

BY D. D. DONNOVAN.

The conference about to be held in Philadelphia to consider university extension attracts public attention to this means of conveying knowledge to those who have not had the advantage of a college education. The city of Philadelphia is a very appropriate place for such a conference, as it was there the movement started in this country, and became quite popular for a time. The movement in Philadelphia assumed more the form of popular lectures rather than college work, but during the last year some of the colleges have taken up the work in a systematic manner, with apparently good results.

My purpose in this article is to speak of what Brown University, Providence, R. I., is doing towards forwarding the movement. In a recent address, Professor Monroe, who has charge of organizing classes in the extension course, after giving a history of the movement in this country and in England, said the university is dependent on the people of the State for the means to carry on their work. They therefore owed a duty to the people at large to make that work as effective as possible, and they felt that the best way to do this was to extend to the people the facilities at their command. The plan pursued is to organize classes of about thirty-five persons, who will choose the subject they wish to study, then the university will send a professor to give them a course of twelve lectures, one each week, for the period of twelve weeks. The sum charged by the university is one hundred dollars for the course, or about twenty-five cents for each lecture, by each member of a class of thirty-five. The weekly exercise consists of about two hours' time; the first hour being occupied by the lecture, and the second hour by class work, answering questions from the members, or giving out problems for solution, according to the nature of the subject taken up by the class.

There are at this time twenty-two classes, or centers, as they are called, in operation, located in the city of Providence and neighboring towns, both in Rhode Island and Massachusetts. The principal subjects are history, literature (both English and French), political economy, physiology, astronomy, and one class in practical physics, and from this class the college authorities expect the most practical results, because it is made up of men who work in the shop, and are, therefore, engaged in actual work, where they can put to practical use the knowledge acquired. This system opens up a means of acquiring technical knowledge by the mechanic not heretofore within his reach, and it is hoped the mechanic himself will see the advantage and avail himself of it.

An institution of learning such as Brown University, with its splendid laboratory—and there are other universities equally well equipped in this respect—when its professors show a disposition to extend a helping hand to the mechanic, and show him how the head can assist the hand, offers to the mechanic facilities that even technical schools cannot supply; for, while the number that can avail themselves of the benefit of the technical school is limited to practically a few, the university is ready to extend to all who desire, the benefits of university extension.

This feature of the work is somewhat in the line of the technical schools in operation in England, as referred to by Mr. W. H. Booth in his article in the AMERICAN MACHINIST of December 17, 1891, and the same argument he so ably sets forth in favor of the system will apply here, though the conditions are somewhat different.

The university extension movement is yet in its infancy, but the results so far warrant the belief that it is destined to grow, and open the doors of our educational establishments to both men and women who have heretofore looked at them from afar off.

A Big Canal Scheme.

A Washington dispatch says: A project of tremendous magnitude and importance is to be brought before Congress by Representative Chipman, of Michigan, and will be urged by him before the Foreign Affairs Committee, of which he is a Democratic member. It involves the construction of a canal around Niagara Falls, on the American side, and the building of a ship canal across the State of New York, from that point to the Hudson River, so that vessels from the lakes can pass through to the ocean.

The canal would be about 150 feet wide, and would have to be twenty feet deep in order to accommodate the large vessels of the lakes. The cost of such a canal would be anywhere from $30,000,000 to $50,000,000, but when the immense amount of money paid out annually for transferring cargoes from ship to rail and from rail to ship is taken into consideration, Representative Chipman says the canal would soon pay for itself.

"The canals would restore the American flag to the ocean much more effectively than could any system of bounties. Thousands of American ships would supplement the thousands already on the lakes, and would make voyages to every part of the world.

"The great shipbuilding industries of the lakes would increase enormously, and other Clydes would grow up on the waters of Erie, Huron, Michigan and Superior.

"I shall at the very first opportunity after the reassembling of Congress introduce a bill for the appointment of a commission to make surveys and estimate the cost. I suppose some people will oppose even this, on the ground that future expenses will be incurred. Indeed, I hear that there will be opposition to a liberal River and Harbor bill in the present Congress. If there is to be economy, it must be in some other direction.

"Cheap transportation is a national necessity, a necessity in the highest sense of national growth and prosperity."

Mr. Gladstone is, perhaps, of all Englishmen, a man whose utterances in public mean something. Upon a recent occasion, when he gave utterance to the belief that the labor question in England had come to be one of the foremost questions of the day, he made a statement that is bound to receive consideration. He spoke in favor of shorter hours of labor, and in favor of such a revision of the land laws as would enable the people to acquire land. His speech, which was before the Liberal Club, is taken as being entirely in favor of the workingmen of Britain.

MANUFACTURES

A malleable-iron plant is to be erected at Troy, N. Y.

A fertilizer factory will be established at Bareville, Pa.

The San Francisco Bridge Company will build a $3,000 bridge over Green River, near Seattle, Washington.

Fallon & Senger have applied to the city council (New Orleans, La.,) for privilege to erect a blacksmith shop.

There is talk of the organization of a $30,000 stock company to establish a knitting-mill at Edenton, Tenn.

The American Construction Company has obtained franchise to erect an electric light plant in Dardanelle, Ark.

John A. Hall, of Covington, Ky., has purchased the Paris Ice Factory, at Paris, for $13,405, and will put it in operation.

Lewis Albezett, of Northampton, Mass., has acquired and will operate the Durham (N. C.) Foundry and Machine Works.

O. T. Dozier will, it is stated, organize a stock company for the manufacture of his patent mailing machine, at Birmingham, Ala.

It is understood that Michigan capitalists are negotiating with a view to eventually owning the American Nail Works at Findlay, Ohio.

The Midvale Steel Company, Philadelphia, Pa., has moved into its new works. The capacity of these works is said to be 100 tons per day.

The sale of the Troy (N. Y.) Co-operative Stove Works, consisting of ten buildings, engine, shafting and machinery, has been effected, to William H. Howe, for $20,000.

A steel bridge is to be built across Wolf River, in the town of Maine, Outagamie County, Wis. Capt. N. M Edwards, civil engineer, Appleton, Wis., can furnish particulars.

John Maslin & Son, Jersey City, N. J., send us several slips, in which are illustrated and described their vacuum pumps, and various devices relating to pumping machinery.

H. M. Caldwell, president of the Elyton Land Company, is credited with the statement that W. T. Northington, now of Prattville, will probably erect a $1,000,000 cotton-mill at Birmingham, Ala., some time in the future.

There is water-works agitation in Pittsburgh, Pa.; Bridgeport, Conn; Vancouver, B. C.; Guthrie, Ind. Ter.; Asheville, N. C.; Milwaukee, Wis; Honey Grove, Fla.; Muskegon, Mich.; Medical Lake, Wash; Cincinnati, Ohio; Colville, Wash.

The Graves Elevator Company, of Rochester, N. Y., have filed articles of incorporation. The capital of the incorporated concern is $400,000, and the incorporators are: L. S. Graves, Fred B. Graves, Charles V. Grohs, R. A. Heimburger, and William S. Denny.

The Wellington Machine Company, of Wellington, Ohio, has been chartered, to engage in running a foundry and manufacturing wood-working machinery, by Frank W. Bennett, Edward F. Webster, Harry S. Bennett, Christopher McDermott and Chas. H Horton. Authorized capital, $100,000.

The Sterling Emery Wheel Company, 174 Fulton street, New York, has issued a new catalogue of emery grinding machinery made by the company; also of similar machinery made by other manufacturers, and sold from the company's office. A great number of grinding machines are illustrated and described.

The Standard Oil Fuel Burner Co., Fort Plain, N. Y., has issued a circular, in which is set forth a description of their burner, adapted for all purposes where heat for any purpose is required. There is also published a large number of testimonials from large manufacturing concerns that have used this burner.

The Detroit Car Window Ventilator Company, of Detroit, Mich., has been formed, with capital stock of $10,000, for the manufacture of Reynolds' patent car window ventilator. The stockholders of the company are: H. H. Reynolds, John G. Grant, W. H. Woodbury, Chas. M. Hammond, Walter D. Stower, and others. The company is now putting the device upon the market.

The Ongley Electric Co., No. 1 Broadway, N. Y. issue a circular illustrating and describing the Ongley Electric System and Watchman's Register, made by the company. Among other things, the company make a device for stopping an engine by turning a handle at different stations, conveniently located—this in case of accident or impending accident. The catalogue is an interesting one for engineers.

W. W. Callery & Co., 36 and 38 Butler street, Pittsburgh, Pa., have issued a little catalogue describing the Winterton Metal Polish Paste. It is recommended for cleaning all kinds of metal work, and for polishing show cases, band instruments, bicycles, large signs, railings, guns, harness mountings, locomotive jackets and headlights, also for all kinds of fire engine work, hot or cold. While it is said that it will not injure the finest silver-plated ware, it is also said that it will polish iron and steel in such a way as to give a luster, and at the same time fill the pores, so that rusting is prevented.

The Detroit Dry Dock Company has closed with The Berlin Iron Bridge Company, of East Berlin; Conn., for a new fire-proof modern machine shop, which will enable the building of—with the necessary tools—the largest engines required. The building when complete will be one of the finest machine shops on the great lakes, and will compare favorably with any in the country. The plant will have modern appliances, such as electric cranes, two of 20 tons capacity, running the whole length of the building, new machinery, electric lights, etc. The shop will be 201 feet long by 66 feet in width, running along Orleans street with end facing Guion and Atwater streets, and partly overlapping the present quarters, which will be torn down. The main portion of the building will be 200 feet long, 37 feet wide, and 50 feet high in the clear, the two electric cranes running the whole length, with 38 feet of clear space above the floor. Large windows will be placed along the sides, giving abundance of light, and skylight with 12 feet of clear glass will run along the whole roof. Three galleries, 28 feet wide, will open out of the main shop, extending its entire length. The first two will be occupied by light machinery benches, and the top gallery will be arranged for the storage of patterns. Work on the new building will be begun immediately. Two-thirds of it will be erected in eight weeks, and completed in ten. The remainder will be completed as soon thereafter as the old shop can be cleared away.

Machinists' Supplies and Iron.

NEW YORK, January 9, 1892.

Iron—American Pig—No change of importance is to be noted.

We quote Standard Northern brands, No. 1 Foundry, at $16 to $17; No. 2, $15 to $16.50; Grey Forge, $13.75 to $14 50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; $15.50 to $16 for No. 2; $14 25 to $14.50 for No. 3.

Scotch Pig—Coltness is quoted at $22; Eglington, $20.25.

Antimony—The market is steady, with little change in prices.

We quote Cookson's, 13½c. to 13¾c; Hallett's, 12¾c. to 12¼c.; L. X., 15c. to 15¼c.

Copper—Consumers are now buying freely, and some quite large sales of Lake are reported at 10⅞c. 11c. is now about the lowest figure at which supplies can be obtained. Casting Copper is quoted at 10½c. to 10⅝c., and is firm.

Lead—The demand continues light, though prices are firmer. Holders are demanding 4.30c., and do not seem specially anxious to sell at that figure.

Lard Oil—Prime City is quoted at 54c. to 55c.; Western at 53c. to 54c.

Spelter—Stocks are accumulating, and sellers seem more anxious to do business. Holders ask 4.7©c., and 4 60c. is bid.

Tin—The market is very quiet, and values range from 19.80c to 19.90c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

A mechanical draftsman desires position. Address BOX 23, AMERICAN MACHINIST.

A thoroughly practical mechanical draftsman & designer desires position. Box 27, AM MACHINIST.

Wanted—1st class blacksmith and mach. Permanent sit. Write, stating exp., N. H. C., AM. MACH.

Wanted—Immediately, two good machinists on gen. jobbing and repair work. W2, AM. MACHINIST.

A good mech. draftsman, exp'd in des'ng, wishes steady position. A1 references. E. G., AM. MACH.

All-around mechanical draftsman desires situation. Best references Q. E., AMERICAN MACHINIST.

Foreman of small brass foundry desires change of position. A1 refs. Brass Molder, AM. MACH.

Wanted—Foundry foreman; one who is familiar with machine and car wheel work pref'd. Address, giving refs. and exp., Foundry, AM. MACHINIST.

Wanted—A good designer accustomed to strain calculations. Also a good detail draftsman. Address, with refs. and particulars, Ajax, AM. MACH

Mechanical draftsman, 25, college graduate, with 4 years' practical exp. in engine and boiler work, wants to make a change. Box 31, AM. MACHINIST.

Wanted—Pattern maker used to general work, and can do drafting, and is not afraid of work. Box 26, AM. MACHINIST.

Constructing eng'r desires steam plant work or supt's position; salary, $200 monthly. M. E., AM. MACHINIST.

Wanted—A position in drafting room by a draftsman (formerly a pattern maker) with two years' experience under good instruction in pump and general machinery. Penna., AMERICAN MACHINIST.

Wanted—Melter for an iron foundry; none but a first-class man who thoroughly understands the business. Apply to The Davenport & Treacy Co., cor. Ave. D and Eleventh St., New York.

Wanted—A position as foundry foreman; having 20 years' experience on all kinds of light and heavy work, can furnish first-class recommend. Address Box 29, AM. MACHINIST.

Wanted—Plain machine work by a young man for a few months. Five years draftsman and designer, and short time in shop work. References, E. L., 5 Green Street, Milford, Mass.

Wanted—Position as supt. or foreman, by a practical engineer and machinist of wide exp. on machine tools, steam engs., and electrical mach'y; well up in modern practice and the economical manage't of men; A1 references. Expert, care AM. MACHINIST.

Wanted—A first-class workman that is experienced in taking charge of a shop on nice light machine work. None but a first-class man need apply. Address A. K. Z., 3032 5th Avenue, South Minneapolis, Minn.

Wanted—Young man to take charge of about 20 lathe hands, who has had experience as gang boss on piece-work system; also one to take charge of about 20 men on vise work. Address Manufacturer, care AMERICAN MACHINIST.

Wanted—Position as sup't, assist't sup't or designer in a m'f'g concern by a thorough draftsman and mechanical engineer, with 15 years' exp. as machinist, draftsman, & superintend'g eng.; 1st-class ref. Address Theory & Practice, AM. MACHINIST.

An active man, technical graduate, with experience in machine shop and foundry, as draftsman and as salesman for manufacturing establishment, desires to represent a house making good selling specialty, either on road or in large city. Good references. Address "Business," AM. MACHINIST.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d hd-lathes & planers. S. M. York, Clev'd, O.

Best Steel Flue Scrapers. Kelley Co., Erie, Pa.

I wish to contract with parties to make fine composition castings. Address B., AM. MACHINIST.

Wanted—Small second-hand Ice Machine. Parker & Waters, Warren, Ark.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Special leather and cement for covering pulleys; no rivets required; local agents wanted. Crescent Mfg. Company, Cleveland, Ohio.

Wanted, Agency—By an exp'd mech. eng., having large acquaintance with rolling-mills, railroads, machine shops, etc. Address Fred. Hoeppner, 95 Westinghouse Building, Pittsburgh, Pa.

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Men test everything in this world by what it produces.
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BEAMAN & SMITH,
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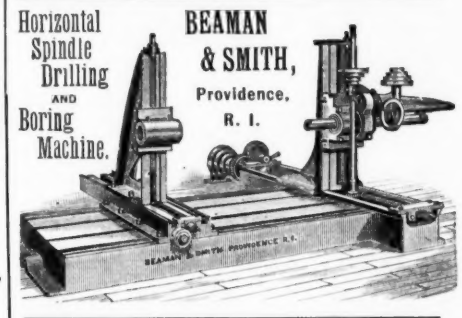

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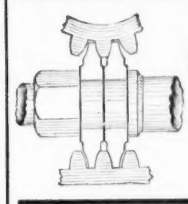

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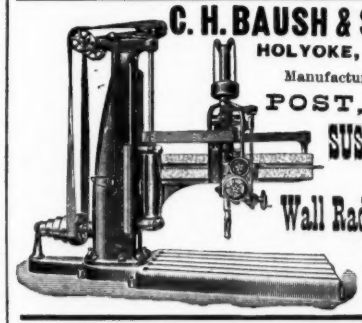

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200 Horse Power second-hand Brown Automatic Engine for sale. All in thorough order and will be sold at a bargain.
S. L. HOLT & BART,
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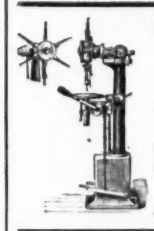

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SIX SPINDLE.
Drills from 1/32 to ¼ hole, speed from 250 to 2000 Rev.
Suitable for a large variety of work and is operated with ease and rapidity.
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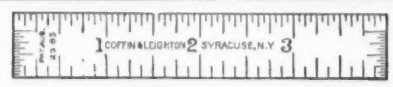
FOR SALE OR LICENSE
The United States Patent of a mechanical invention, returning good profits, in England (books produced). List prices from £25 up to very large amounts, and principally large castings, with very little machine work below. Address S.,
The International News Co.,
Breams Buildings, Chancery Lane,
London, England.



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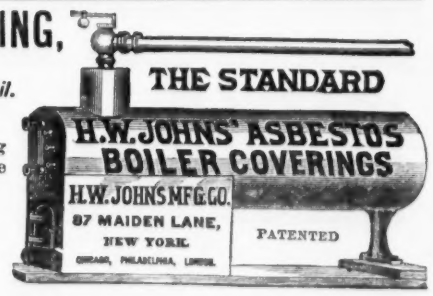

For Sale—Full line of patterns and drawings for stationary and portable steam engines of from 8 to 250 H. P. Address Engine Co., AM. MACHINIST.

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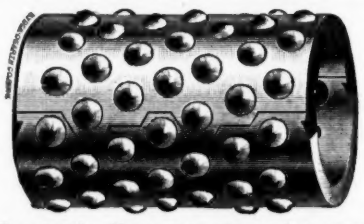

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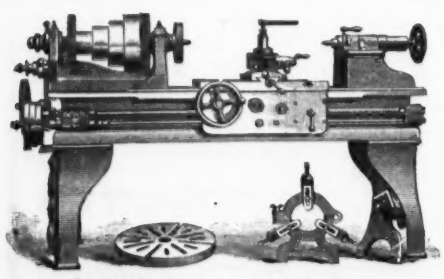

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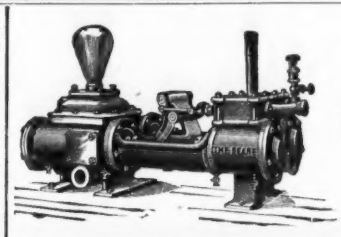

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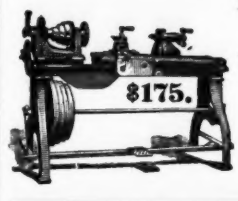

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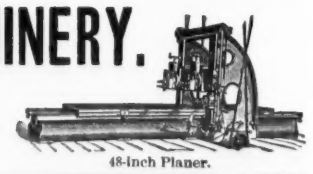

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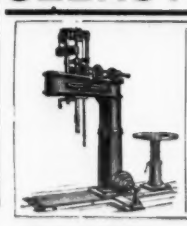

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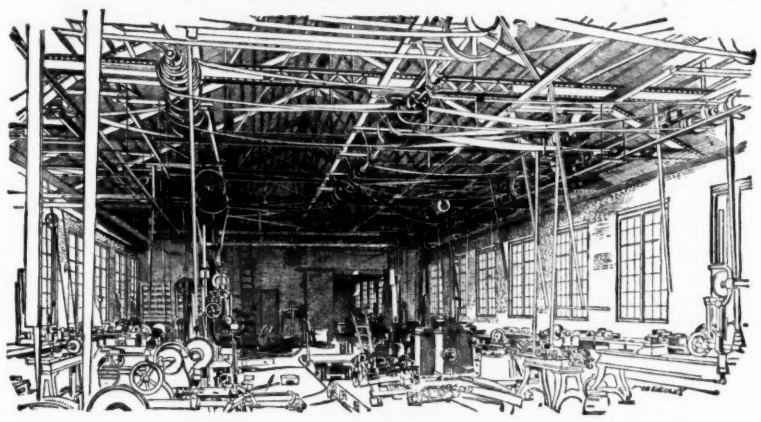

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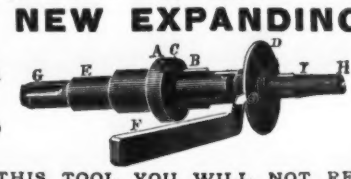

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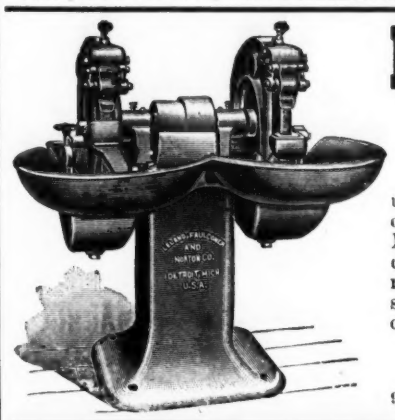

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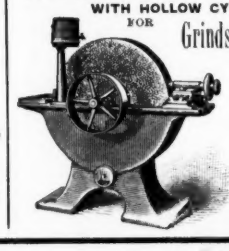

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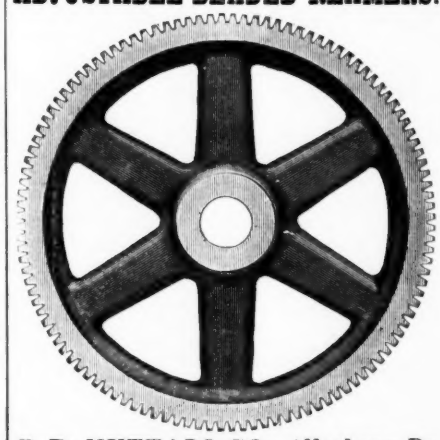

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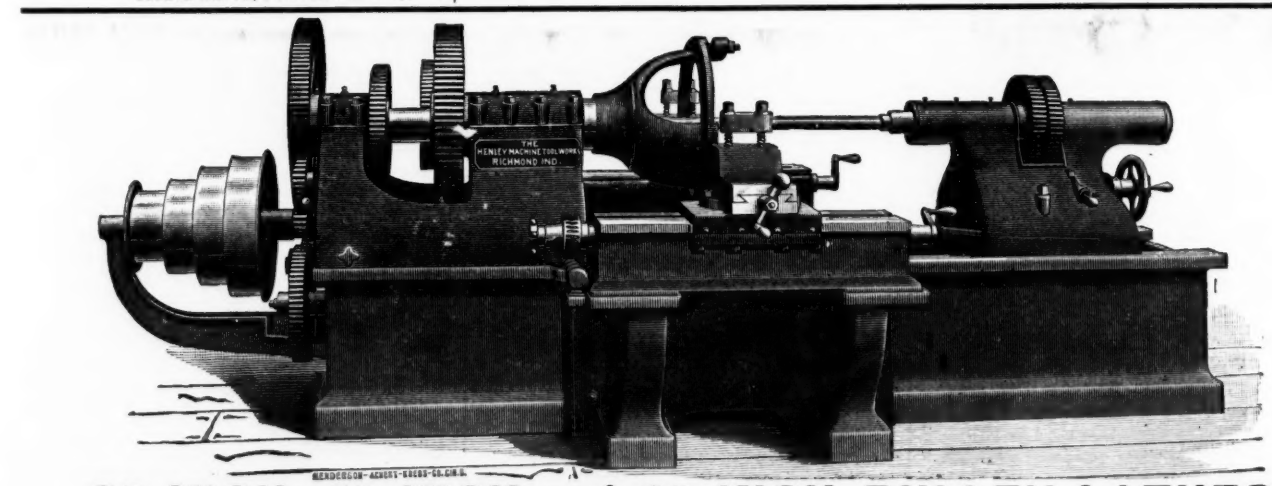

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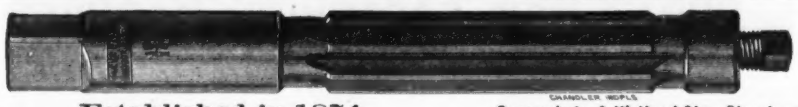

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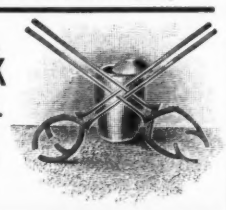

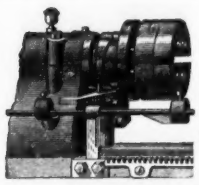

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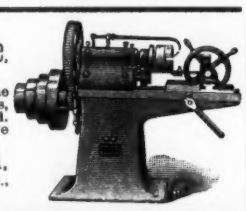

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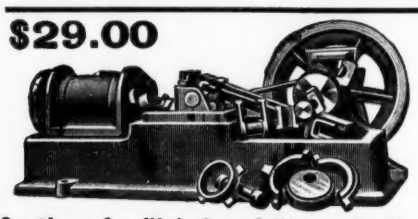

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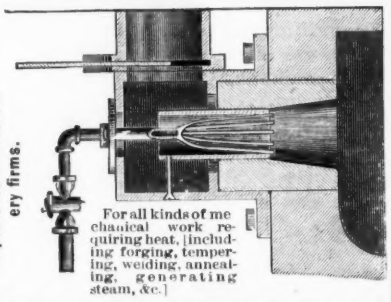

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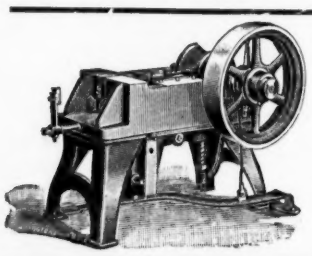

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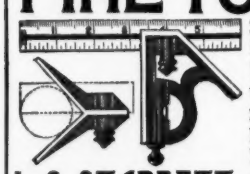

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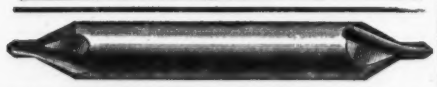

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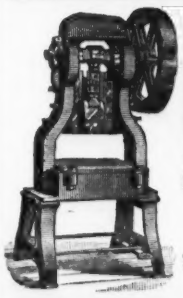

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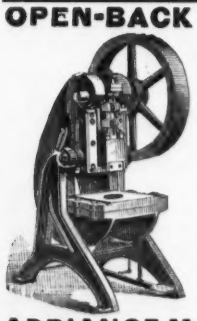

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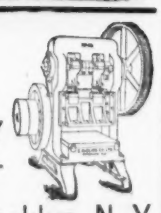

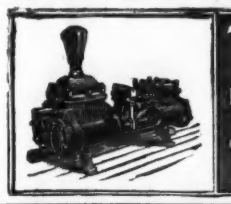

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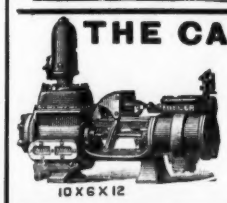

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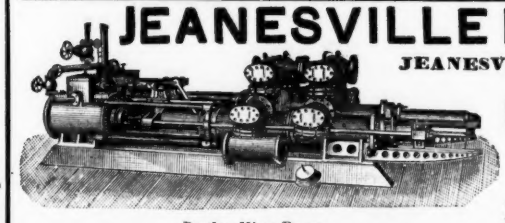

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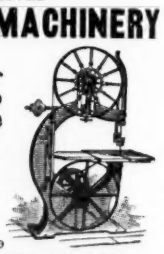

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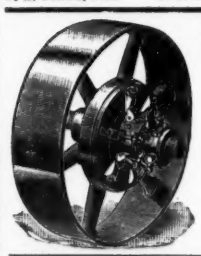

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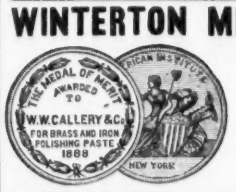

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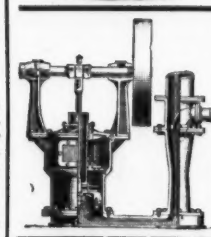

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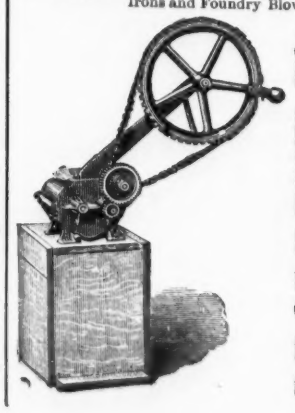

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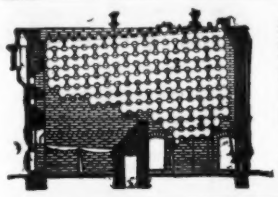

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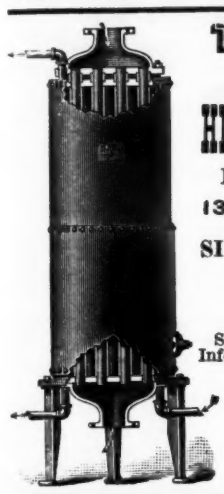

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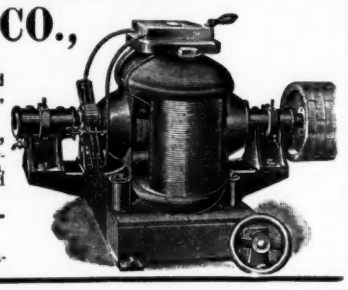

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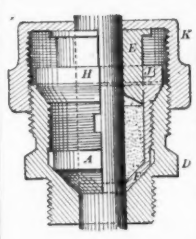

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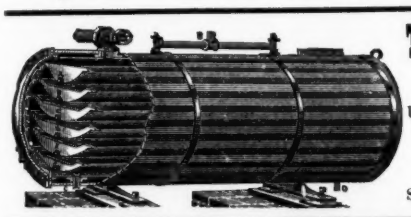

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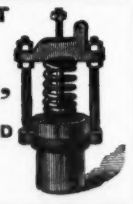

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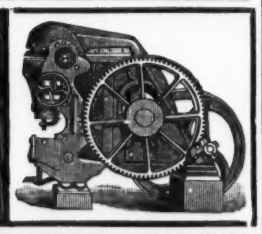

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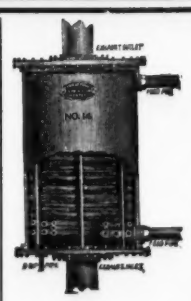

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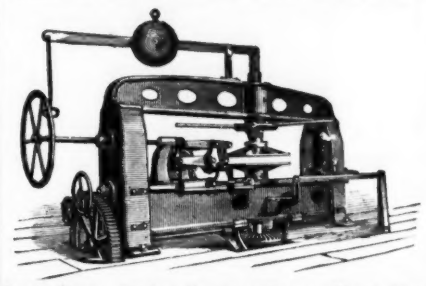

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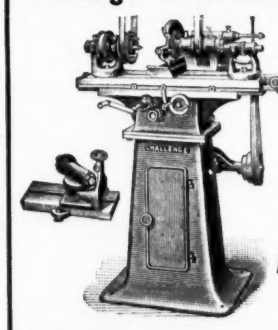

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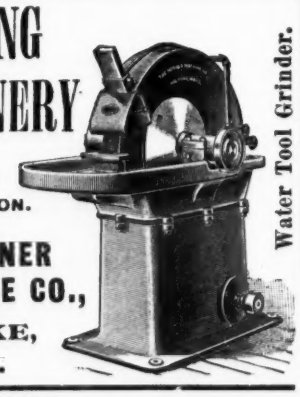

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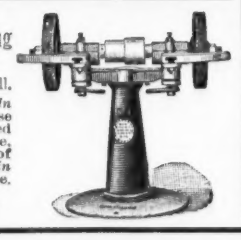

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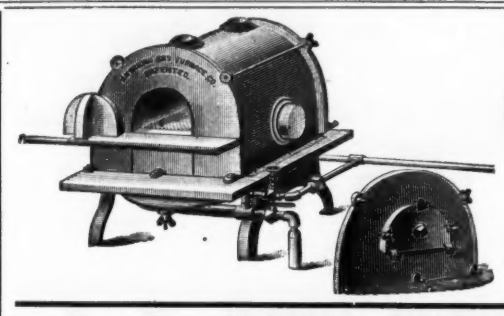

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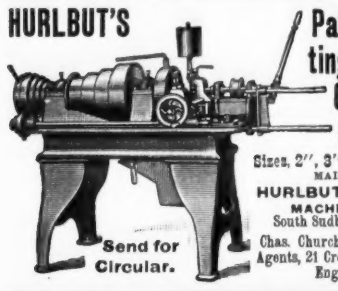

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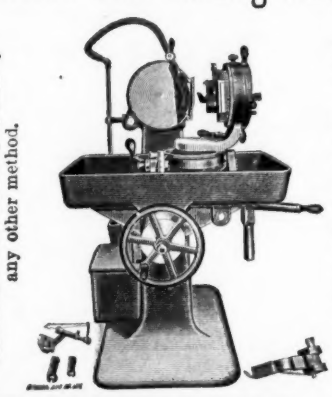

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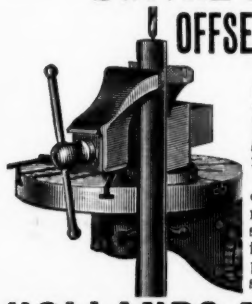

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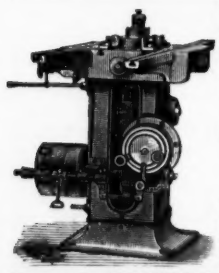

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EAST SAGINAW, MICH.

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PATENT UNIVERSAL DEPTH ANGLE AND SCREW-CUTTING CENTER

TWIST DRILL GAUGE

J. WYKE & CO Fine Machinists Tools E. BOSTON, MASS. Send for LISTS

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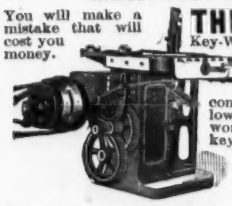
You will make a mistake that will cost you money.



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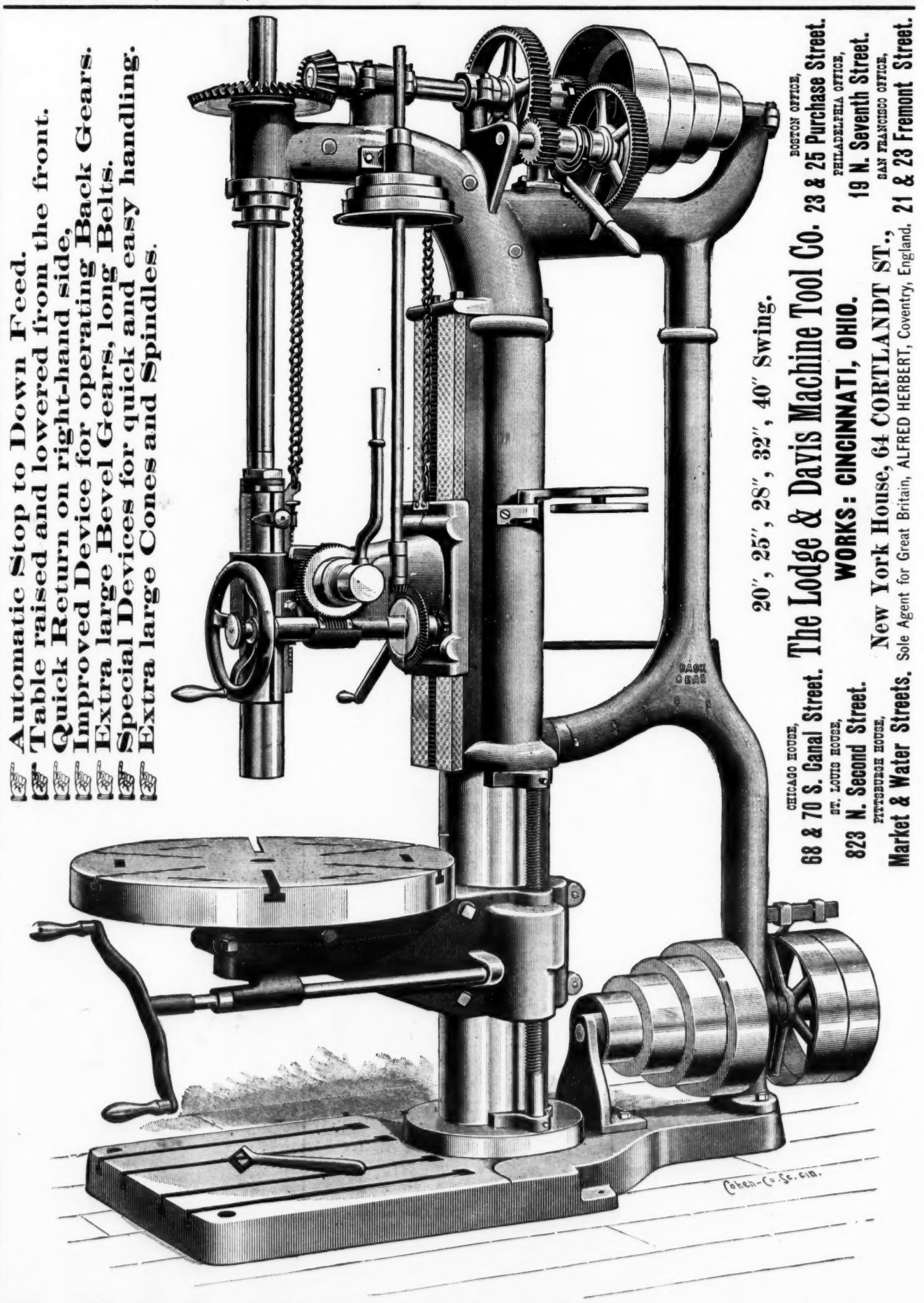

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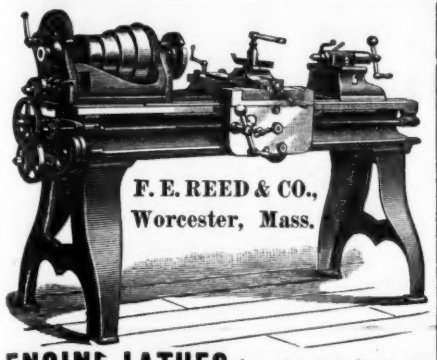

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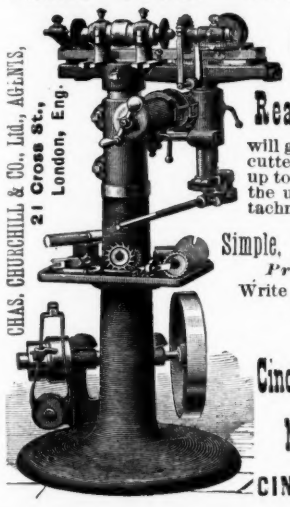

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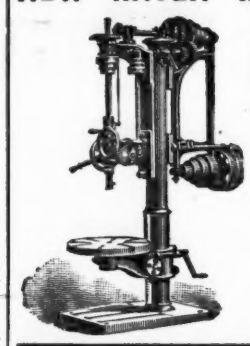

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Planers,
Shapers,
Slotters,
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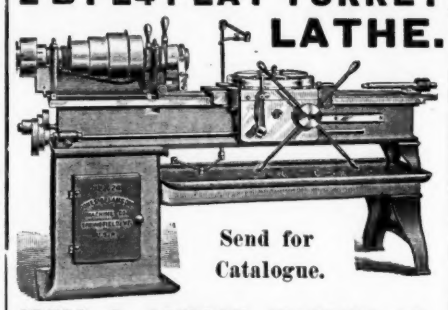

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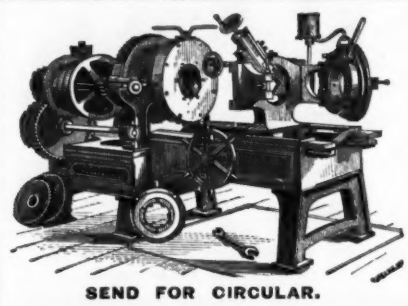

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For Pipe, Mill and Steam Fitters' Use.
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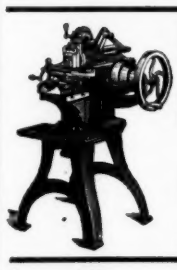

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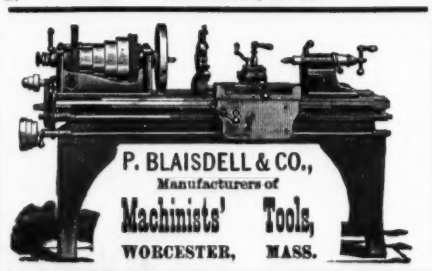

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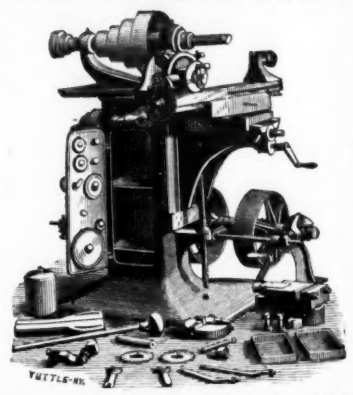

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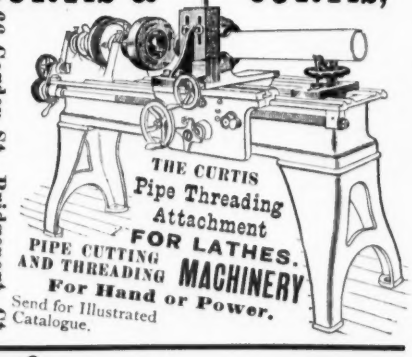

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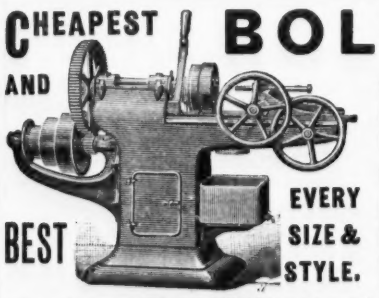

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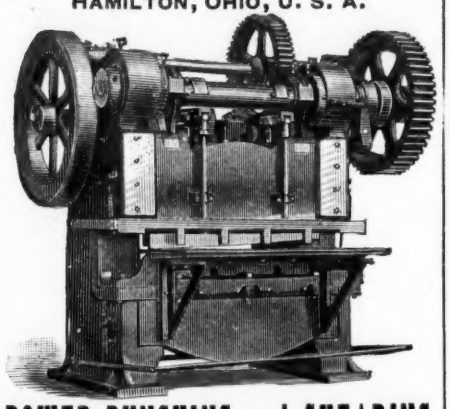
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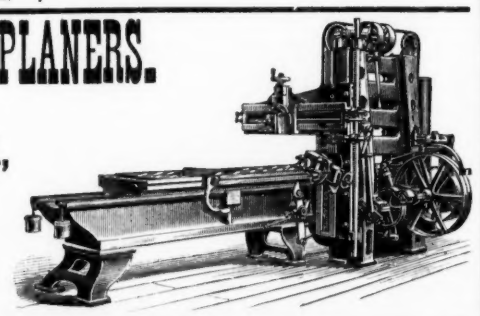

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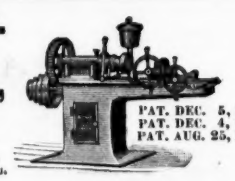
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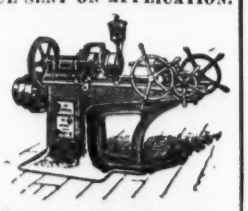

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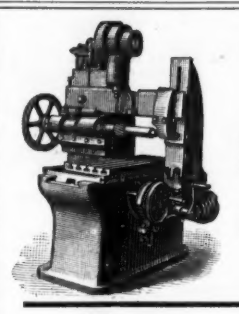
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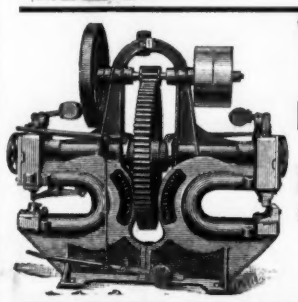
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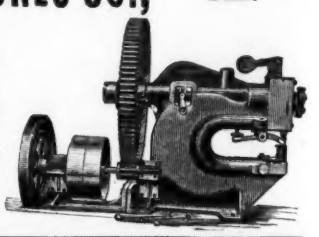

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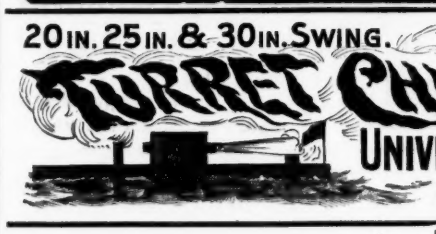
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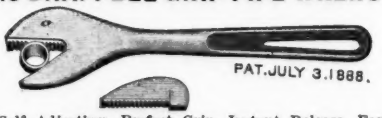

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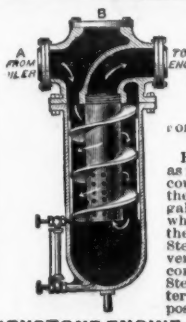

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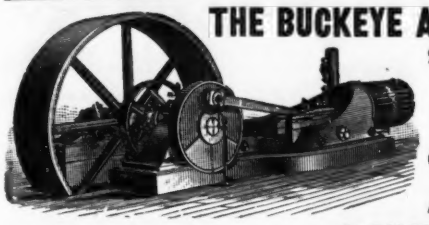

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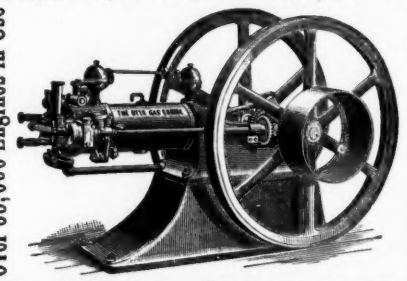

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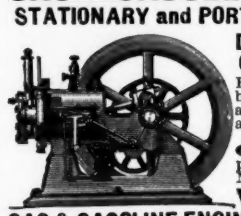

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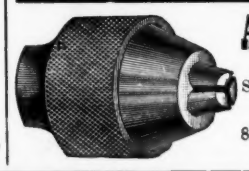

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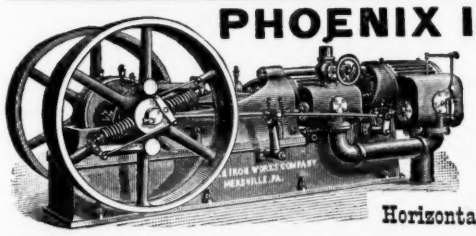

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1 Planer, 24 in. do 6 ft. do	do do
1 Planer, 28 in. do 6 ft. do	do do
1 Planer, 28 in. do 8 ft. do	do do
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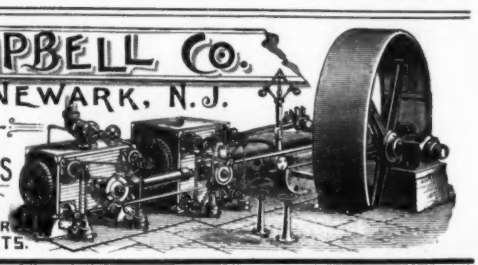

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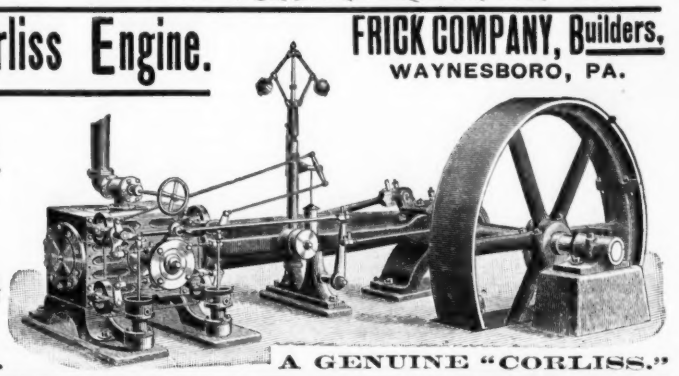

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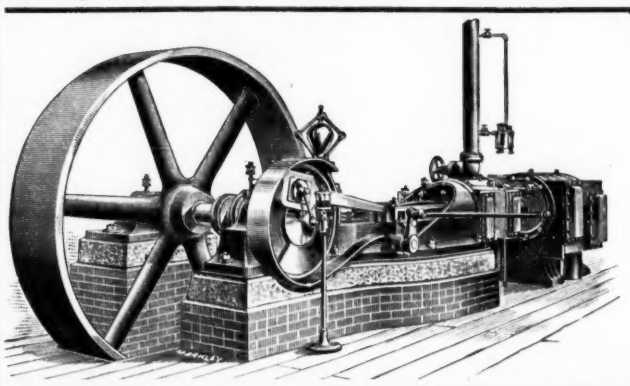

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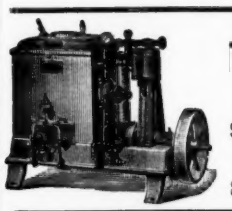

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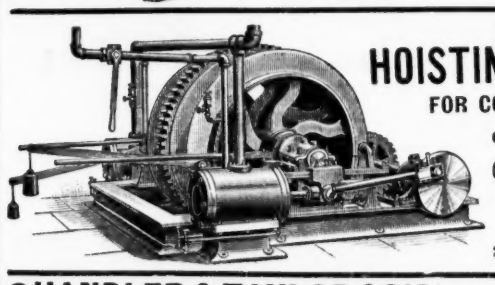

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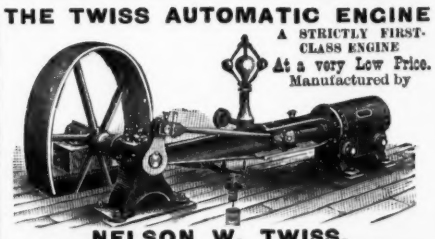

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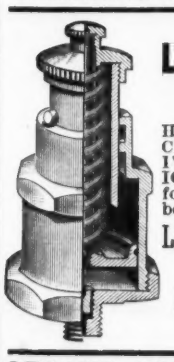

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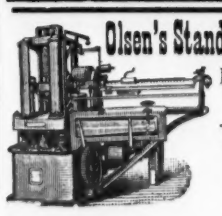

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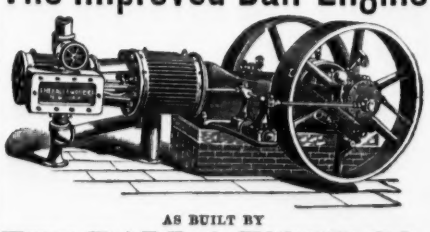

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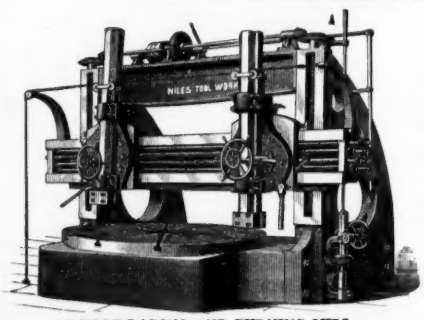

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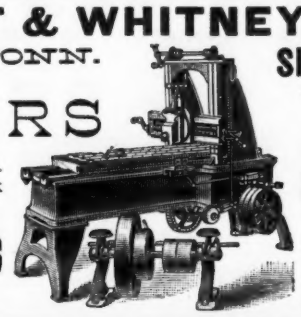

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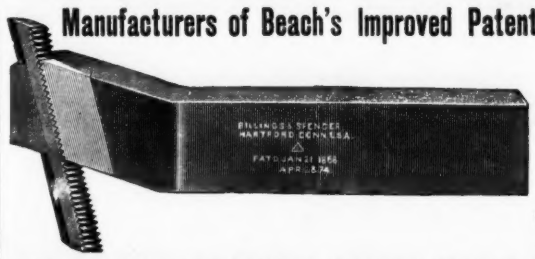

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GENTLEMEN:—In response to yours of the 2nd, we desire to say that we have sold a number of your Metropolitan Automatic Injectors, with pumping plants manufactured by us, and in all cases they have given the very best of satisfaction. They are simple in construction and very reliable.

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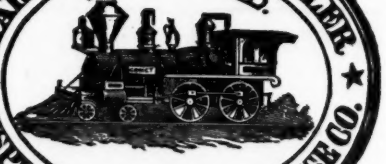

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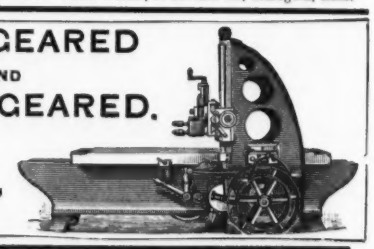

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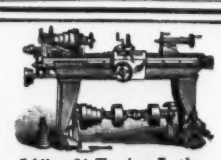
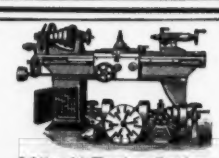
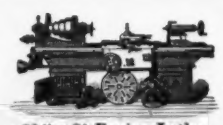


14" × 6' Engine Lathe.



16" × 6' Engine Lathe.



21" × 8' Engine Lathe.

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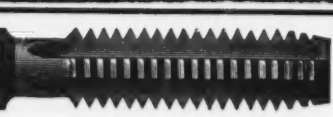

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